Reference Manual
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Rosemount 3308 Series
Wireless Guided Wave Radar, 3308A

Reference Manual

IEC

WirelessHART

ROSEMOUNT

EMERSON
Process Management

Rosemount 3308 Series Wireless Guided Wave Radar Level Transmitter

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

The United States has two toll-free assistance numbers and one international number.

Customer Central
1-800-999-9307 (*7:00 a.m. to 7:00 p.m. CST)*

North American Response Center
1-800-654-7768 (*24 hours a day*)
Equipment service needs

International
1-952-906-8888

⚠ WARNING

Explosions could result in death or serious injury.

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Single lead probes are sensitive for strong electromagnetic fields and therefore not suitable for non-metallic tanks.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

⚠ WARNING

Process leaks could result in death or serious injury.

Only qualified personnel should install the equipment.

Install transmitter prior to process start-up.

Install and tighten process connectors before applying pressure.

Handle the transmitter carefully.

Do not remove the transmitter while in operation.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

⚠ WARNING

Any substitution of non-recognized parts may jeopardize safety. Repair, e.g. substitution of components etc., may also jeopardize safety and is under no circumstances allowed.

⚠ CAUTION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Process Management Sales Representative.

NOTICE

Power Module Considerations

Each Power Module contains two "C" size primary lithium/thionyl chloride batteries. Each battery contains approximately 2.5 grams of lithium, for a total of 5 grams in each pack. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Contacts should be protected to prevent premature discharge.

Battery hazards remain when cells are discharged.

Power modules should be stored in a clean and dry area. For maximum battery life, storage temperature should not exceed 30° C.

The Power Module may be replaced in a hazardous area. The Power Module has surface resistivity greater than one gigaohm and must be properly installed in the wireless device enclosure. Care must be taken during transportation to and from the point of installation to prevent electrostatic charge build-up.

Contents

Section 4: Configuration

Section 5: Operation

Section 6: Service and Troubleshooting

Appendix A: Reference Data

Appendix D: Configuration Parameters

Appendix E: Mapping of Alert Messages in the HART command 48 Additional Status Field

Section 1 Introduction

1.1 Service support

To expedite the return process outside of the United States, contact the nearest Emerson Process Management representative.

Within the United States, call the Emerson Process Management Instrument and Valves Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed. Emerson Process Management Instrument and Valves Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

⚠ CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by Occupational Safety and Health Administration (OSHA), a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

NOTICE

Shipping considerations for wireless products.

The unit was shipped to you without the Power Module installed. Please remove the Power Module prior to shipping the unit.

Each Power Module contains two "C" size primary lithium/thionyl chloride batteries. Primary lithium batteries (charged or discharged) are regulated during transportation by the U.S. Department of Transportation. They are also covered by IATA (International Air Transport Association), ICAO (International Civil Aviation Organization), and ARD (European Ground Transportation of Dangerous Goods). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Consult current regulations and requirements before shipping.

1.2 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration and disposed in accordance with local and national legislation/regulations.

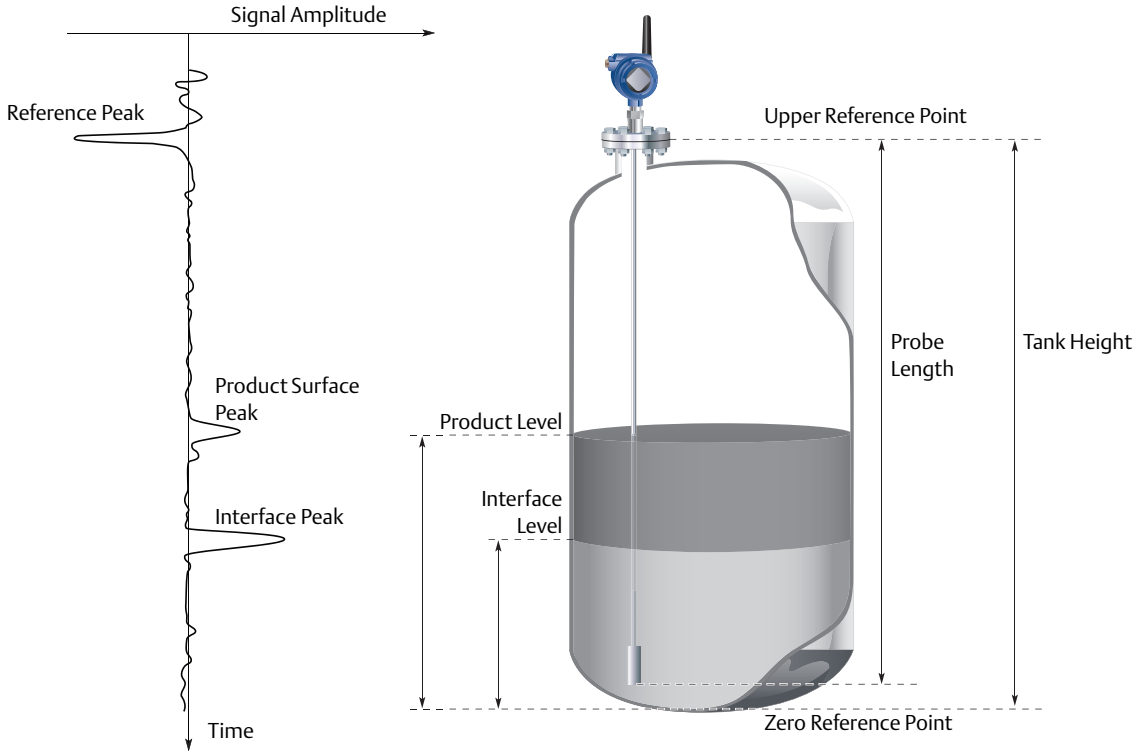
Section 2 Transmitter Overview

2.1 Theory of operation

The Rosemount 3308 Series is the first true wireless level transmitter that is based on the Time Domain Reflectometry (TDR) principle. Low power nano-second-pulses are guided along a probe submerged in the process media. When a pulse reaches the surface of the material it is measuring, part of the energy is reflected back to the transmitter, and the time difference between the generated and reflected pulse is converted into a distance from which the total level or interface level is calculated (see Figure 2-1).

The reflectivity of the product is a key parameter for measurement performance. A high dielectric constant of the media gives better reflection and a longer measuring range.

Figure 2-1. Guided Wave Radar Operating Principle



Reference peak

This peak is caused by the transition between transmitter and the tank vapor space or air. It is used by the transmitter as a starting reference point for distance to the level surface.

Product surface peak

This peak indicates the product level and is caused by a reflection from the product surface.

Interface peak

This peak indicates the interface level. The peak is caused by reflection from the interface between an upper product and a bottom product with a relatively high dielectric constant. This peak is identified when the Measurement Mode is set to Product Level and Interface Level or Interface Level with Submerged Probe.

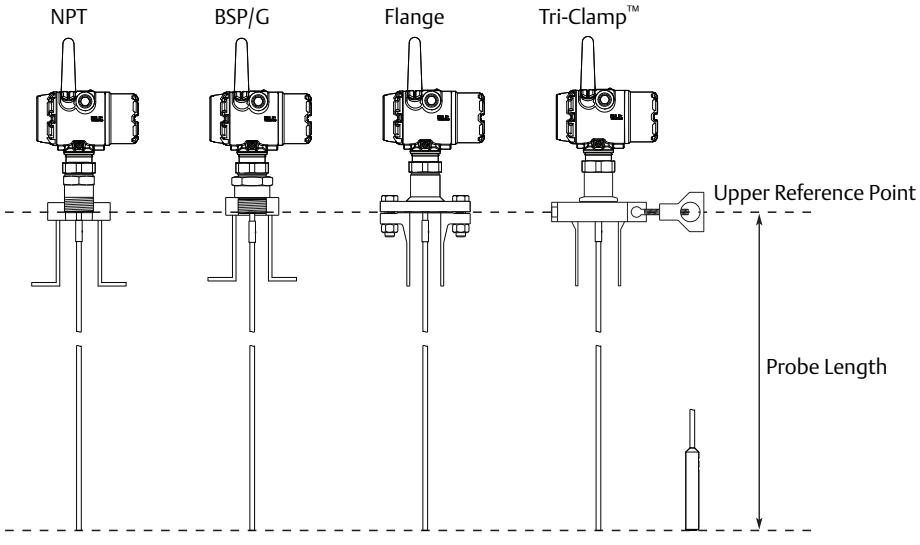
Probe end peak

It is caused by reflection from the probe end. If the probe is grounded, the peak will be positive. If the probe end is submerged in a high dielectric media, such as water, it will not be visible.

Upper reference point

The Upper Reference Point is located at the underside of the transmitter flange or the bottom end of the threaded adapter, as illustrated in Figure 2-2 on page 4.

Figure 2-2. Upper Reference Point



Zero reference point

The Zero Reference Point is selected by the user and is usually located close to or at the bottom of the tank. The Zero Reference Point can be set to any position in the tank by adjusting the Tank Height.

Tank height

The Tank Height is the distance from the Upper Reference Point to the Zero Reference Point. The transmitter measures the distance to the product surface and subtracts this value from the Tank Height to determine the level.

Probe length

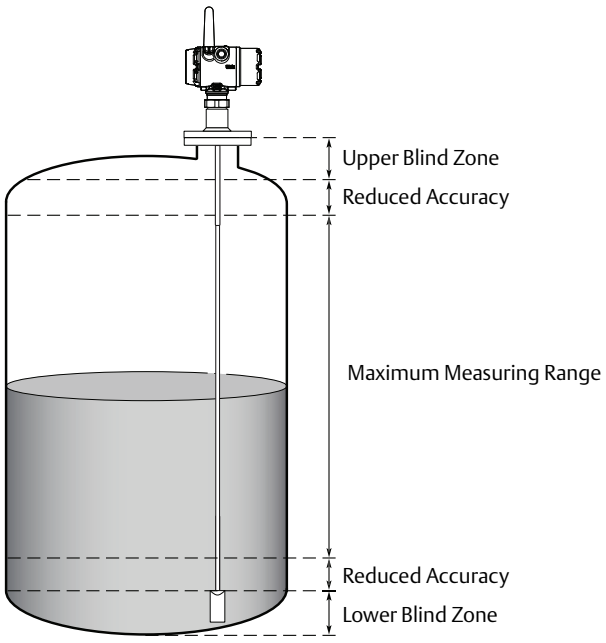
The probe length is the distance between the Upper Reference Point and the end of the probe. If a weight is used at the end of the probe it shall be included.

Blind zones

The measuring range depends on probe type, dielectric constant of the product and installation environment, and is limited by the Blind Zones at the very top and bottom of the probe. In the Blind Zones, the accuracy exceeds ±1.18 in. (30 mm), and measurements may not be possible. Measurements close to the Blind Zones will have reduced accuracy.

Figure 2-3 illustrates how the measuring range is related to the Blind Zones and the areas with reduced accuracy. Values for different probe types and dielectric constants are presented in section "Accuracy over measuring range" on page 108.

Figure 2-3. Blind Zones

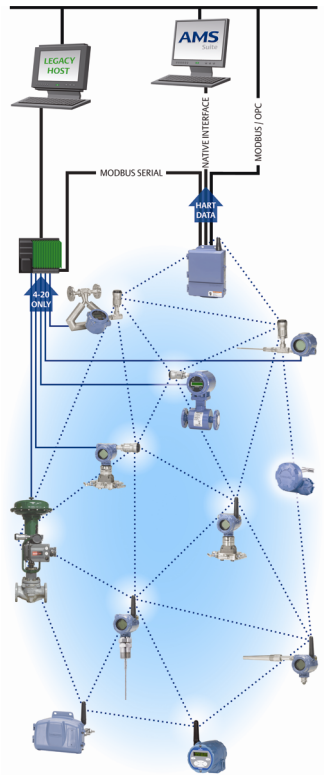


Note
Measurements may not be possible in the Blind Zones, and measurements close to the Blind Zones will have reduced accuracy. Therefore, the alarm points should be configured outside these zones.

2.2 Emerson's Smart Wireless

Emerson Smart Wireless is a self-organizing network solution. Wireless field instruments send data to a Gateway, directly or routed through any of the wireless devices in the network, as illustrated in Figure 2-4. Multiple communication paths are managed and analyzed in parallel to assure optimal communication and sustained network reliability even if obstructions are introduced.

Figure 2-4. Emerson Smart Wireless Network



Gateways interface with existing host systems using industry standard protocols, and native integration into DeltaV™ and Ovation is transparent and seamless.

Interference from other radios, WiFi, and EMC sources is avoided through Time Synchronized Channel Hopping and Direct Sequence Spread Spectrum (DSSS). Also, a layered security implementing industry standard Encryption, Authentication, Verification, Anti-Jamming, and Key Management ensures that data transmissions are secure and received only by the Gateway.

2.3 Application characteristics

2.3.1 Tank shape

The guided wave radar transmitter is insensitive to the tank shape. Since the radar signal travels along a probe, the shape of the tank bottom has no effect on the measurement performance. The transmitter handles flat or dish-bottom tanks equally well.

2.3.2 In-tank obstructions

The Rosemount 3308 Series Transmitter is relatively insensitive to objects in the tank since the radar signal is transmitted along a probe.

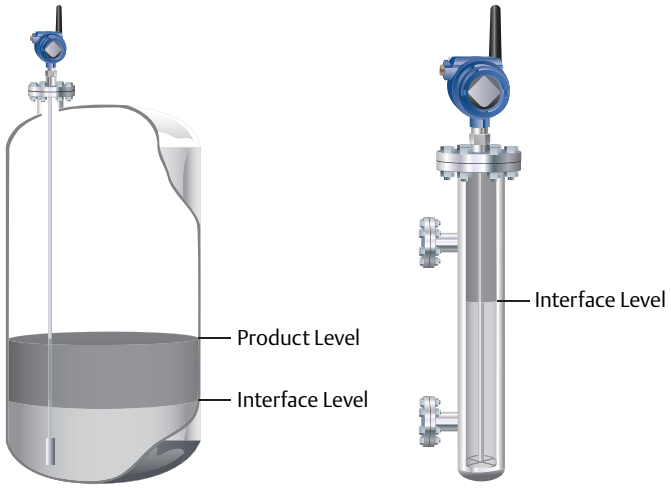
Avoid physical contact between probes and agitators as well as applications with strong fluid movement unless the probe is anchored. If the probe can move within 1 ft (30 cm) away from any object, such as an agitator, during operation then probe tie-down is recommended.

In order to stabilize the probe for side forces, you have the option to either hang a weight at the probe end (flexible probes only) or fix/guide the probe to the tank bottom.

2.3.3 Interface level measurement

Rosemount 3308 Series Transmitter is well suited for measuring the interface of oil and water, or other liquids with significant dielectric differences.

Figure 2-5. Interface Level Measurement



All probes can be used for measuring interfaces. Single probes are the preferred choice in almost all applications but depending on the application and installation geometries a coaxial probe or a flexible twin probe may be a better fit.

For measuring the interface level, the transmitter uses the residual wave of the first reflection. Part of the wave, which was not reflected at the upper product surface, continues until it is reflected at the lower product surface. The speed of this wave depends fully on the dielectric constant of the upper product.

The maximum allowable upper product thickness/measuring range is primarily determined by the dielectric constants of the two liquids. Target applications include interfaces between oil/oil-like and water/water-like liquids. For such applications the upper product dielectric constant is low (<3) and the lower product dielectric constant is high (>20). Refer to "Interface measurements" on page 106 for further interface application guidelines.

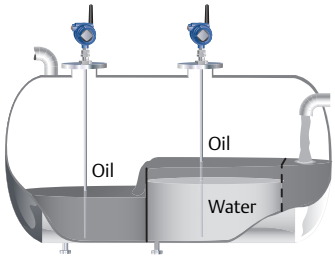
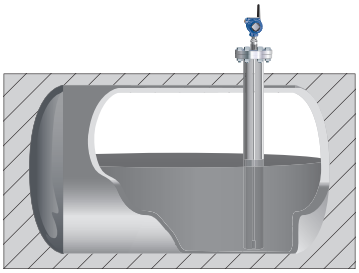
Emulsion layers

Sometimes there is an emulsion layer (mix of the products) between the two products which, depending on its characteristics, will affect interface measurements. Please consult factory for guidelines on how to handle emulsion layers.

2.4 Application examples

The Rosemount 3308 Series Transmitter is suited for aggregate (total) level measurements on a wide range of liquids, semi-liquids, and liquid to liquid interfaces.

Moreover, the reliable and accurate guided wave radar technology offers a versatile solution that is virtually unaffected by process conditions such as temperature, pressure, vapor gas mixtures, density, turbulence, bubbling/boiling, varying dielectric media, pH, and viscosity.

Production, storage, and buffer tanks	The Rosemount 3308 Series Transmitter is ideal for production and shorter storage or buffer tanks that contain oil, gas condensate, water, or chemicals.	
Low pressure separators	The Rosemount 3308 Series Transmitter can measure both level and interface level in for example separator applications.	
Waste tanks and sump pits	The Rosemount 3308 Series Transmitter is a good choice for waste tanks and underground tanks, such as sump pits.	
Chamber applications	The Rosemount 3308 Series Transmitter is a good choice for both chamber and pipe installations.	

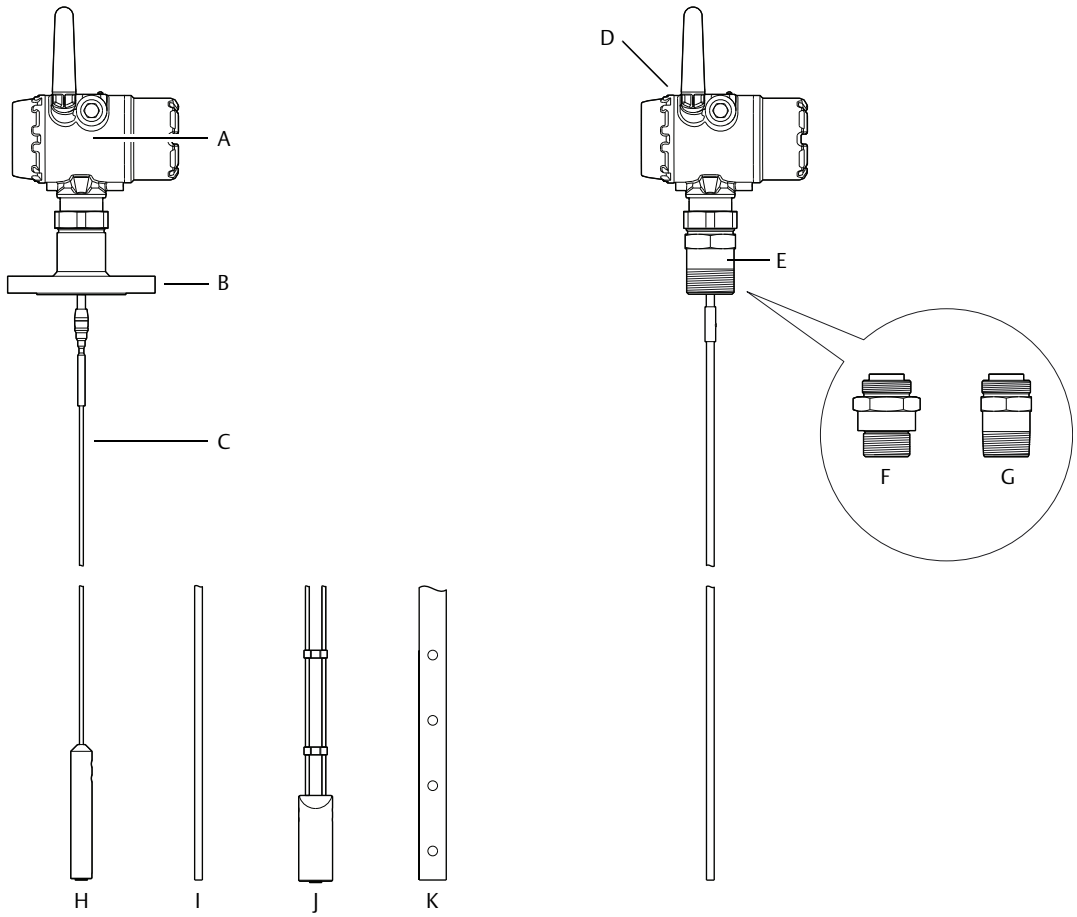
2.5 Components of the transmitter

The Rosemount 3308 Series transmitter housing contains advanced electronics for signal processing. The transmitter housing is made of aluminum or stainless steel, depending on specified option code.

The radar electronics produces an electromagnetic pulse which is guided by the probe.

There are different probe types available for various applications: Flexible Single Lead, Rigid Single Lead, Flexible Twin Lead, and Coaxial.

Figure 2-6. Transmitter Components



A. Radar Electronics
B. Flanged Process Connections
C. Probe
D. Dual Compartment Housing
E. Threaded Process Connections
F. BSP (G)
G. NPT
H. Flexible Single Lead with weight
I. Rigid Single Lead
J. Flexible Twin Lead with weight
K. Coaxial

2.6 Probe selection guide for the Rosemount 3308 Series Transmitter

Use the following guidelines to choose appropriate probe for your Rosemount 3308 Series transmitter:

Table 2-1. Probe Selection Guide. G=Good, NR=Not Recommended, AD=Application Dependent (consult factory)

	Flexible single lead	Rigid single lead	Flexible twin lead	Coaxial
Measurements				
Level	G	G	G	G
Interface (liquid/liquid)	G	G	G	G[(1)]
Process medium characteristics				
Changing density	G	G	G	G
Changing dielectric[(2)]	G	G	G	G
Wide pH variations	G	G	G	G
Pressure changes	G	G	G	G
Temperature changes	G	G	G	G
Condensing vapors	G	G	G	G
Bubbling/boiling surfaces	G	G	G	G
Foam (mechanical avoidance)	NR	NR	NR	AD
Foam (top of foam measurement)	AD	AD	AD	NR
Foam (foam and liquid measurement)	AD	AD	AD	NR
Clean liquids	G	G	G	G
Liquid with dielectric<2.0	AD	AD	AD	AD
Coating liquids	G	G	NR	NR
Viscous liquids	G	G	AD	NR
Crystallizing liquids	AD	AD	NR	NR
Solids/Powders	NR	NR	NR	NR
Fibrous liquids	G	G	NR	NR
Tank environment considerations				
Probe is close (<12 in./30 cm) to disturbing objects	NR	NR	AD	G
Tall and narrow mounting nozzles (diameter <6 in./15 cm and height>diameter + 4 in./10 cm)	AD	AD	AD	G
Probe might touch nozzle / disturbing object	NR	NR	NR	G

	Flexible single lead	Rigid single lead	Flexible twin lead	Coaxial
Liquid or vapor spray might touch probe	NR	NR	NR	G
High turbulence	AD(3)	G	AD(3)	G
Turbulent conditions causing breaking forces	AD	NR	AD	NR
Non-metallic tanks or open atmosphere applications	AD(4)	AD(4)	AD(4)	G

(1) Not in fully submerged applications.
(2) For overall level applications a changing dielectric has no effect on the measurement. For interface measurements a changing dielectric of the top fluid will degrade the accuracy of the interface measurement.
(3) Ok If probe is anchored.
(4) Not suitable in applications with disturbing EMC from nearby equipment.

Section 3 Installation

3.1 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow safe installation guidelines could result in death or serious injury.

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Make sure the transmitter is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

⚠ WARNING

Explosions could result in death or serious injury.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Single lead probes are sensitive for strong electromagnetic fields and therefore not suitable for non-metallic tanks.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

⚠ WARNING

Process leaks could result in death or serious injury.

Only qualified personnel should install the equipment.

Install transmitter prior to process start-up.

Install and tighten process connectors before applying pressure.

Handle the transmitter carefully.

Do not remove the transmitter while in operation.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

⚠ WARNING

Electronic boards are electrostatically sensitive. Failure to observe proper handling precautions for static-sensitive components can result in damage to the electronic components. Do not remove the electronic boards from the Rosemount 3308 Series Transmitter.

⚠ WARNING

To ensure long life for your radar transmitter, and to comply with hazardous location installation requirements, tighten covers on both sides of the electronics housing.

⚠ WARNING

Any substitution of non-recognized parts may jeopardize safety. Repair, e.g. substitution of components etc., may also jeopardize safety and is under no circumstances allowed.

⚠ CAUTION

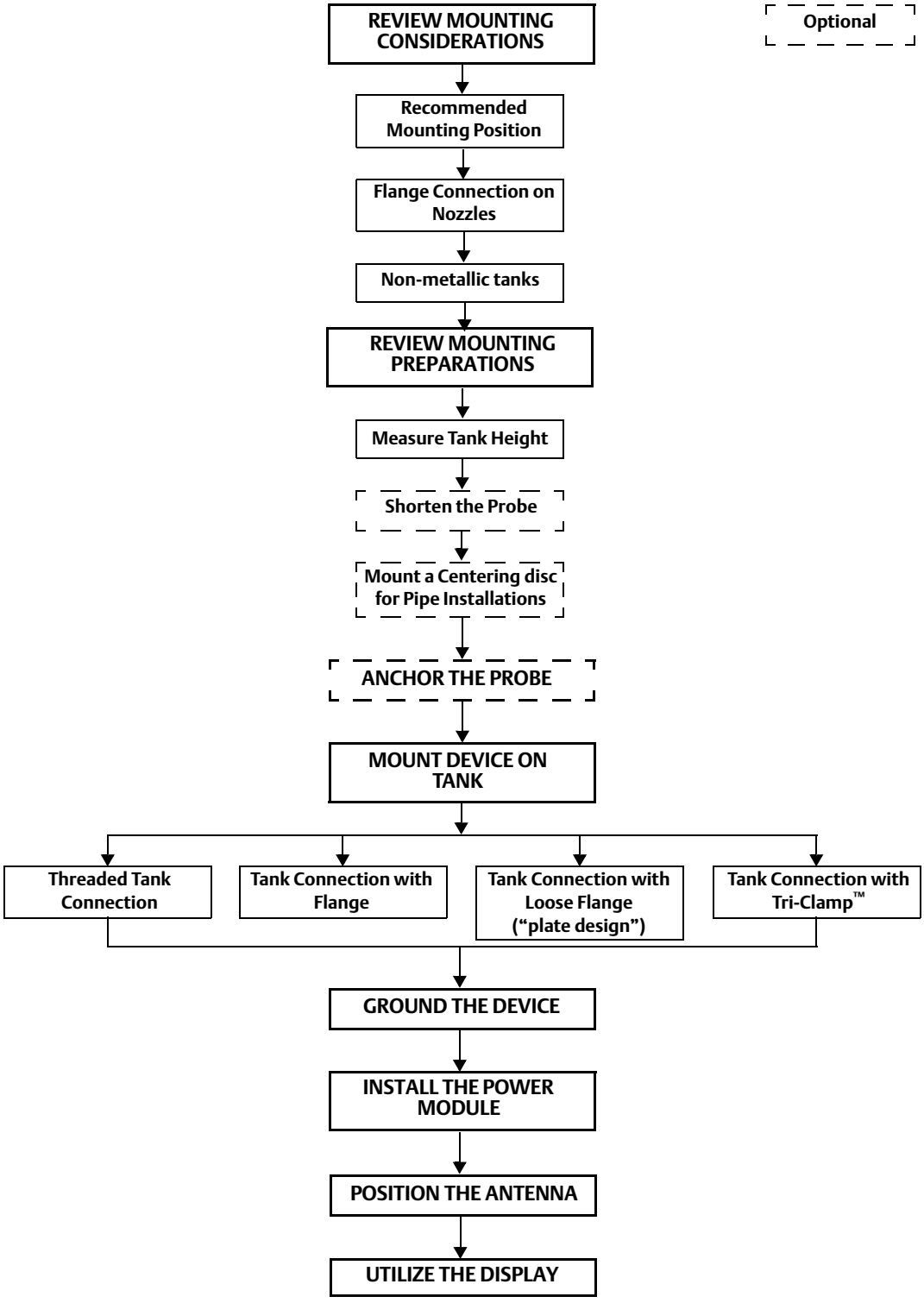
Use caution when handling the Power Module. The Power Module may be damaged if dropped from heights in excess of 20 ft (6 m).

⚠ CAUTION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

3.2 Installation procedure

Follow these steps for proper installation:



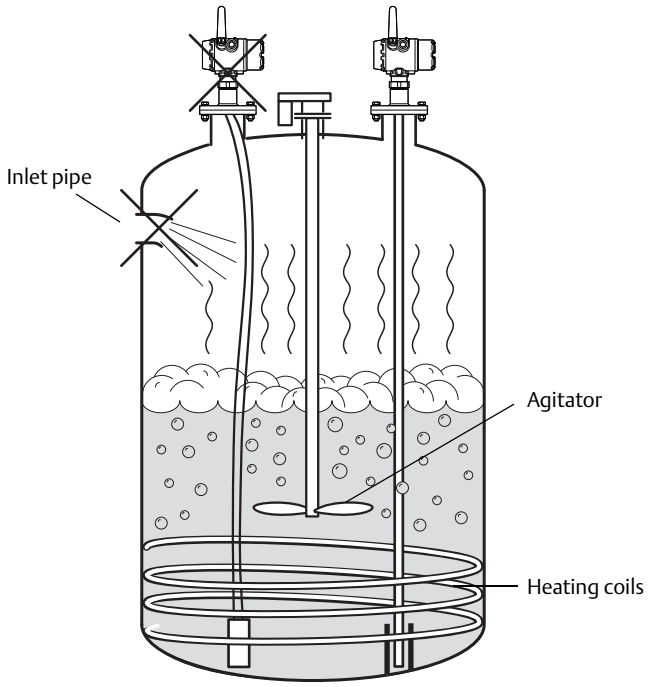
3.3 Review mounting considerations

Before installing the Rosemount 3308 Series Transmitter, consider recommendations for sufficient free space, mounting position and special needs for non-metallic tanks.

3.3.1 Recommended mounting position

When finding an appropriate mounting position for the transmitter, the conditions of the tank must be carefully considered. The transmitter should be mounted so that the influence of disturbing objects is reduced to a minimum. For easy access to the transmitter make sure that it is mounted with sufficient service space.

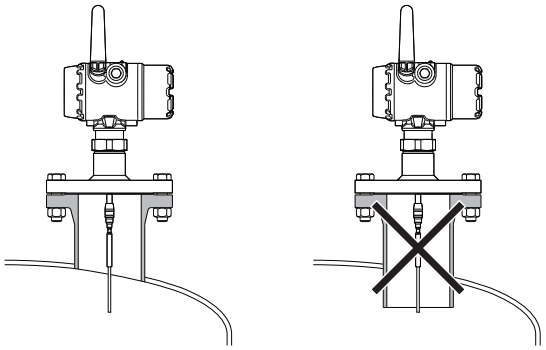
Figure 3-1. Mounting Position



The following guidelines should be considered when mounting the transmitter:

- Do not mount close to inlet pipes.
- Do not mount close to agitators. If the probe can move to within 12 in. (30 cm) away from an agitator, the probe should be anchored. See “Anchor the probe” on page 30 for more information.
- If the probe tends to sway due to turbulent conditions in the tank, the probe should be anchored. See “Anchor the probe” on page 30 for more information.
- Avoid mounting close to heating coils.
- Position the probe such that it is subject to a minimum of lateral force.
- Make sure the probe does not come into contact with the nozzle or other objects in the tank.

- Make sure the nozzle does not extend into the tank.



Note
Violent fluid movements causing high sideway forces may break rigid probes.

If the probe is mounted close to a wall, nozzle or other tank obstruction, noise might appear in the level signal. Therefore the following minimum clearance, according to Table 3-1, must be maintained.

Figure 3-2. Free Space Requirement

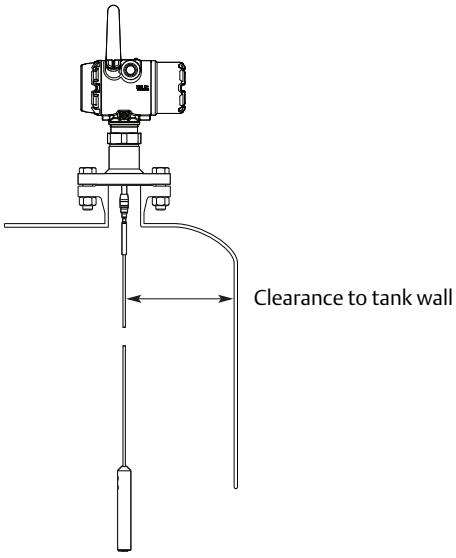
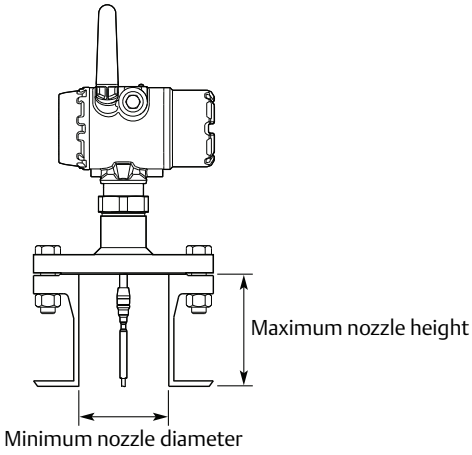


Table 3-1. Recommended Minimum Free Space to Tank Wall or Other Objects in the Tank

Probe type	Condition	Minimum free space
Rigid Single/Flexible Single	Smooth metal wall	4 in. (100 mm)
	Disturbing objects such as pipes and beams, or rugged metal tank walls	16 in. (400 mm)
Flexible Twin	Smooth metal wall	4 in. (100 mm)
	Disturbing objects such as pipes and beams, or rugged metal tank walls	16 in. (400 mm)
Coaxial	N/A	0 in. (0 mm)

3.3.2 Flange connection on nozzles

Figure 3-3. Mounting in Nozzles



The transmitter can be mounted in nozzles by using an appropriate flange. It is recommended that the nozzle size is within the dimensions given in Table 3-2.

Note
The probe must not be in contact with the nozzle (except for the coaxial probe).

Table 3-2. Nozzle Considerations

	Flexible single lead probe	Rigid single lead probe	Flexible twin lead probe	Coaxial probe
Recommended nozzle diameter	4 in. (100 mm) or more	4 in. (100 mm) or more	4 in. (100 mm) or more	> probe diameter
Minimum nozzle diameter(1)	1.5 in. (38 mm)	1.5 in. (38 mm) for probe type 4A 2 in. (50 mm) for probe type 4B	2 in. (50 mm)	> probe diameter
Maximum nozzle height(2)	4 in. (100 mm) + nozzle diameter(3)	4 in. (100 mm) + nozzle diameter	4 in. (100 mm) + nozzle diameter	N/A

(1) The Trim Near Zone (TNZ) function may be necessary or an Upper Null Zone (UNZ) setup may be required to mask the nozzle.
(2) Recommended maximum nozzle height. For coaxial probes there is no limitation on nozzle height.
(3) For nozzles taller than 4 in. (100 mm), the Long Stud version is recommended (option code LS) to prevent the flexible portion from touching the edge of the nozzle.

3.3.3 Non-metallic tanks

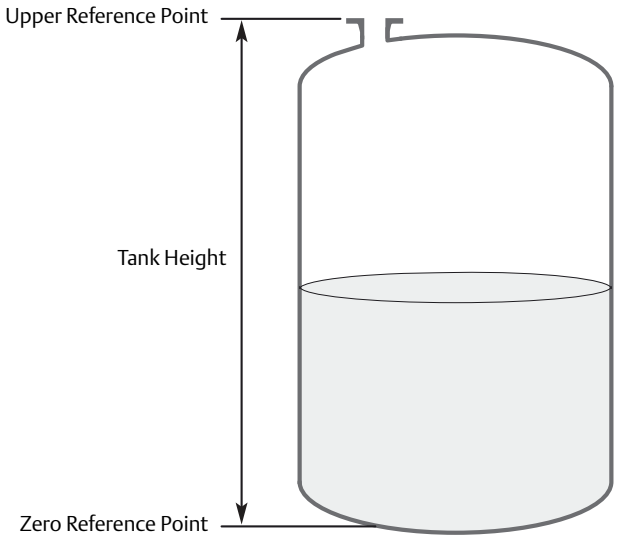
Flexible twin lead probe or coaxial probe are the recommended choice for non-metallic tanks. Single lead probes are not suited for non-metallic tanks or open atmosphere applications, due to high susceptibility to strong electromagnetic fields.

3.4 Review mounting preparations

3.4.1 Measure tank height

The Tank Height is defined as the measured distance from the Upper Reference Point to the Zero Reference Point.

Figure 3-4. Measure Tank Height



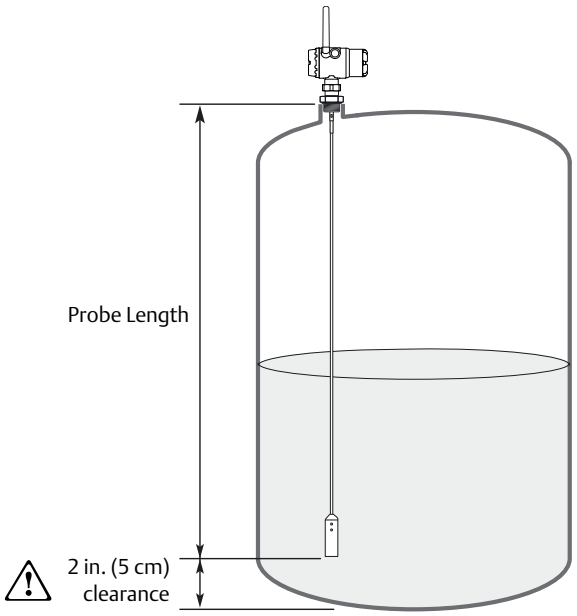
3.4.2 Shorten the probe

In order to leave some clearance distance between the probe end and the tank bottom, the probe might have to be shortened. The goal is to have the probe hang straight so that it does not touch the wall. 2 in. (5 cm) is a suggested value. The probe can be shortened in field. Use the following form to calculate the probe length:

Probe Length = Tank height - 2 in. (5 cm)

After shortening the probe make sure to update the transmitter configuration to the new probe length, see "Probe Length" on page 161.

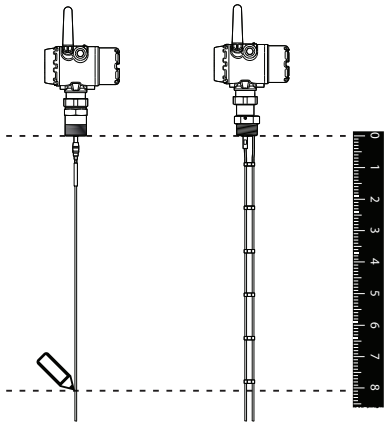
Figure 3-5. Calculate Probe Length



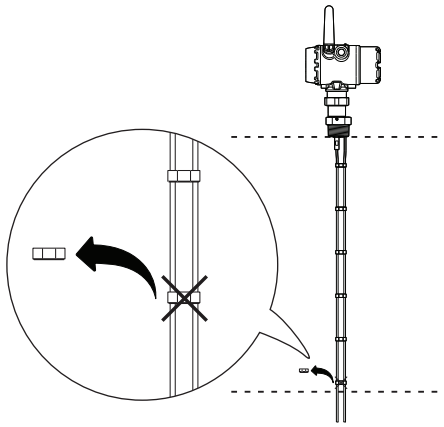
Flexible single/twin lead probe

Note
The PTFE covered probes must not be cut in field.

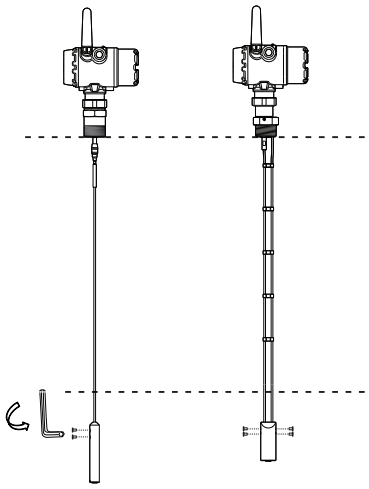
1. Mark where to cut the probe.



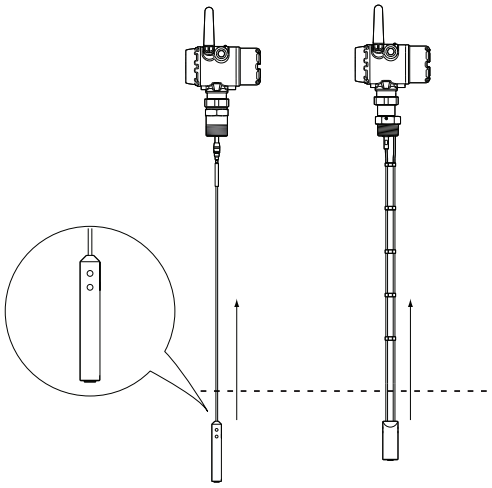
2. Remove enough spacers to make place for the weight (only flexible twin lead probes).



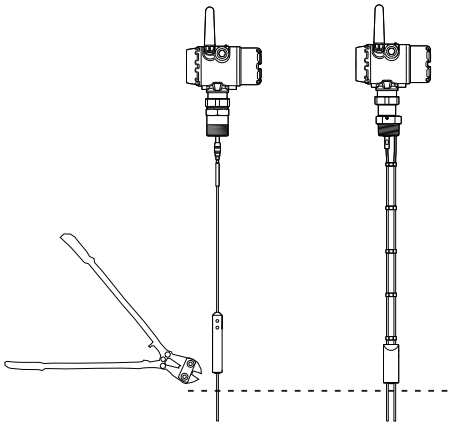
3. Loosen the weight.



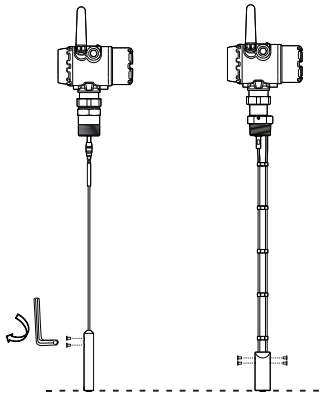
4. Slide the weight up.



5. Cut the probe at the mark.



6. Fasten the weight with the following torque:
   - Small weight (W1): 5 Nm
   - Short weight (W2): 5 Nm
   - Heavy weight (W3): 5 Nm
   - Weight, Flexible Twin: 6 Nm

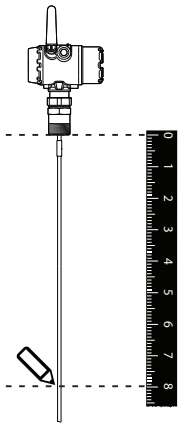


Rigid single lead probe

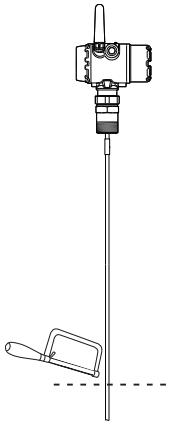
Note
The PTFE covered probes must not be cut in field.

Note
Make sure the lead is fixed while cutting.

1. Mark where to cut the probe.

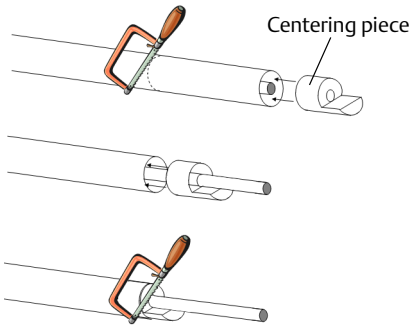


2. Cut the probe at the mark.

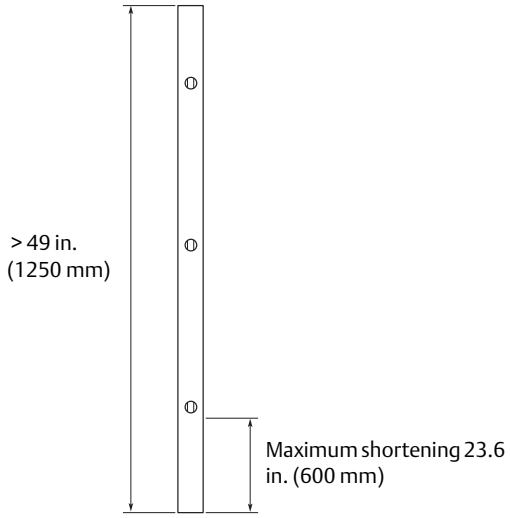


Coaxial probe

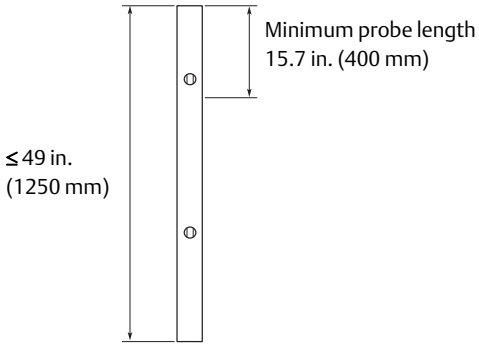
1. Mark where to cut the probe.
2. Insert the centering piece.
   (The centering piece is delivered from factory and should be used to prevent the spacers centering the rod from coming loose).
3. Cut the tube to the desired length.
4. Move the centering piece.



5. Cut the rod inside the tube. Make sure the rod is fixed with the centering piece while cutting.
   - Pipes longer than 49 in. (1250 mm) can be shortened by as much as 23.6 in. (600 mm).



   - Pipes shorter than 49 in. (1250 mm) can be cut as long as the remaining length is not less than 15.7 in. (400 mm).

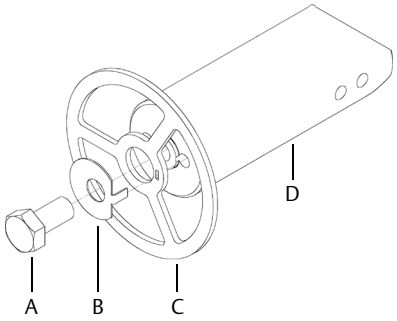


3.4.3 Mount a centering disc for pipe installations

To prevent the probe from contacting the chamber or pipe wall, centering discs are available for flexible single, rigid single, and flexible twin lead probes. The disc is attached to the end of the probe.

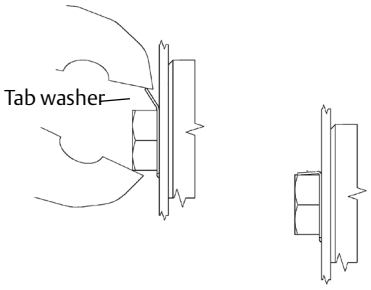
Flexible single/twin lead probe

Figure 3-6. Centering Disc at the End of the Weight



A. Bolt
B. Tab washer
C. Centering disc
D. Weight

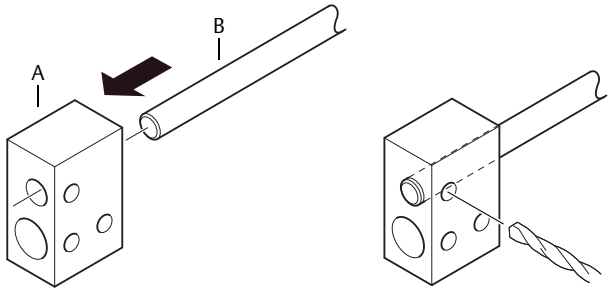
1. Mount the centering disc at the end of the weight.
2. Make sure that the tab washer is properly inserted in the centering disc.
3. Fasten the centering disc with the bolt.
4. Secure the bolt by folding the tab washer.



Rigid single lead probe (8 mm)

Note
Centering discs shall not be used with PTFE covered probes.

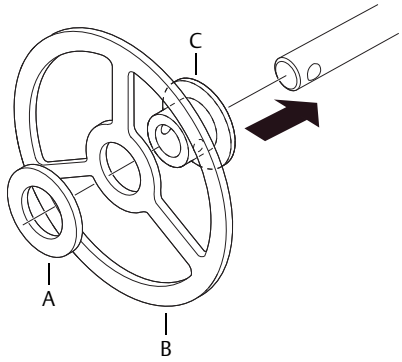
1. Drill one hole using the drilling fixture (included in your shipment).



A. Drilling fixture
B. Probe

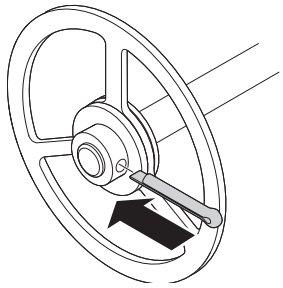
2. Mount the bushing, centering disc, and washer at the probe end.

Note
Do not mount the washer if the centering disc material is PTFE.

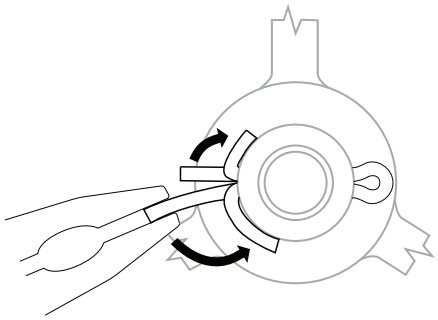


A. Washer
B. Centering disc
C. Bushing

3. Insert the split pin through the bushing and the probe.

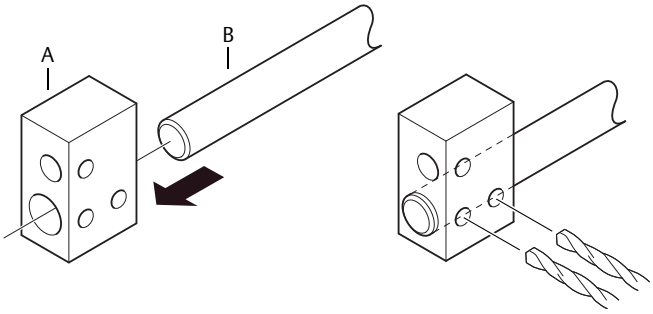


4. Secure the split pin.



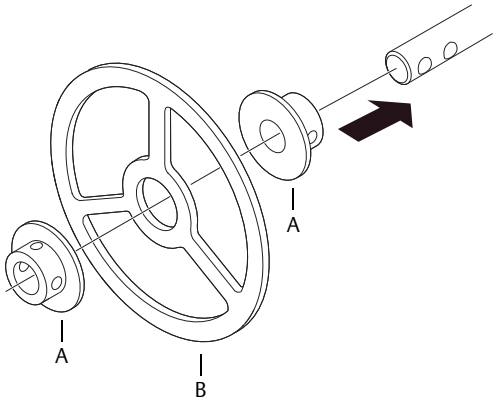
Rigid single lead probe (13 mm)

1. Drill two holes using the drilling fixture (included in your shipment).



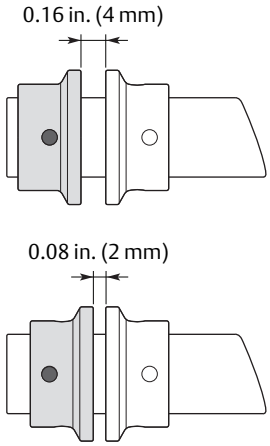
A. Drilling fixture
B. Probe

2. Mount the bushings and centering disc at the probe end.

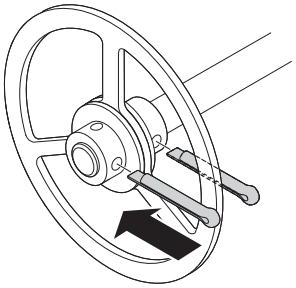


A. Bushing
B. Centering disc

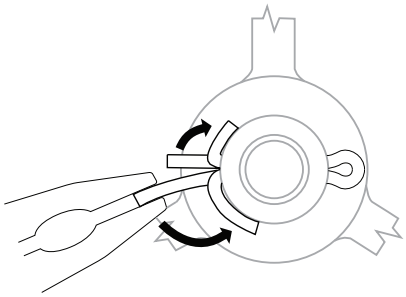
3. Adjust distance by shifting hole for split pin in lower bushing.



4. Insert the split pins through the bushings and the probe.



5. Secure the split pins.



3.5 Anchor the probe

In turbulent tanks it may be necessary to fix the probe. Depending on the probe type, different methods can be used to guide the probe to the tank bottom. This may be needed in order to prevent the probe from hitting the tank wall or other objects in the tank, as well as preventing a probe from breaking.

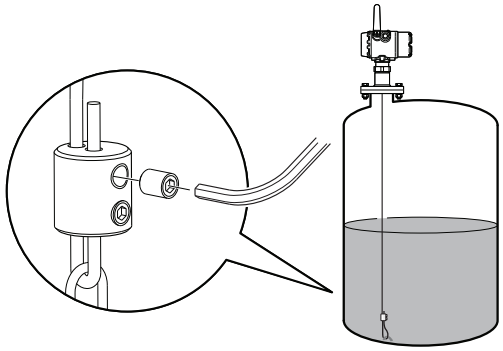
3.5.1 Flexible single/twin lead probe

The flexible single lead probe itself can be used for anchoring. Pull the probe rope through a suitable anchoring point, e.g. a welded eye, and fasten it with a chuck.

The length of the loop will add to the Blind Zone. The location of the chuck will determine the beginning of the Blind Zone. See “Accuracy over measuring range” on page 108 for further information on Blind Zones.

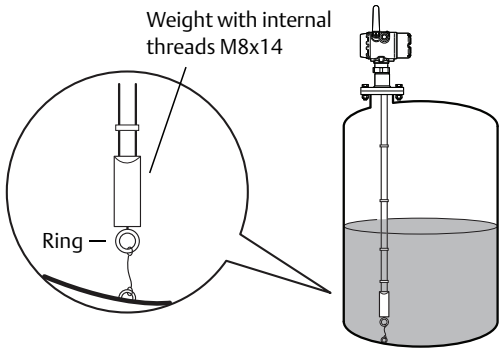
The Probe Length should be configured as the distance from the Upper Reference Point to the top of the chuck.

Figure 3-7. Flexible Single Lead Probe with Chuck



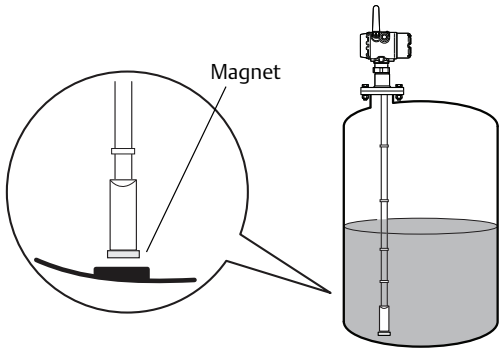
A ring (customer supplied) can be attached to the weight in a threaded (M8x14) hole at the end of the weight. Attach the ring to a suitable anchoring point.

Figure 3-8. Flexible Twin/Single Lead Probe with Weight and Ring



A magnet (customer supplied) can be fastened in a threaded (M8x14) hole at the end of the weight. The probe can then be guided by placing a suitable metal plate beneath the magnet.

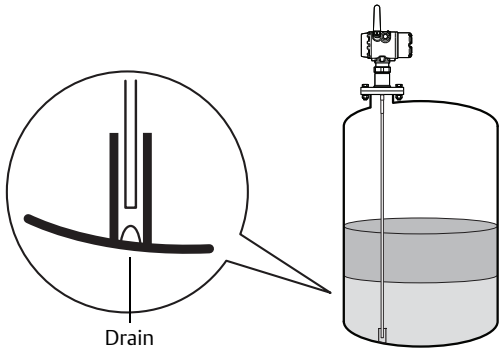
Figure 3-9. Flexible Twin/Single Lead Probe with Weight and Magnet



3.5.2 Rigid single lead probe

The rigid single lead probe can be guided by a tube welded on the tank bottom. Tubes are customer supplied. Make sure that the probe can move freely in order to handle thermal expansion. The measurement accuracy will be reduced close to the tube opening.

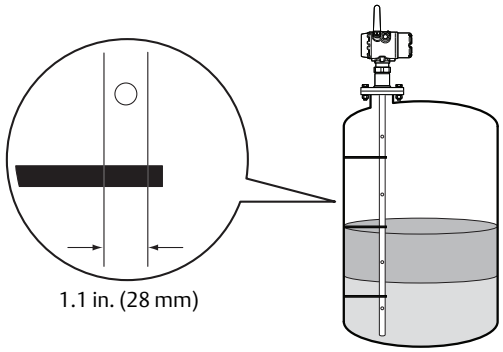
Figure 3-10. Rigid Single Lead Probe with Tube



3.5.3 Coaxial probe

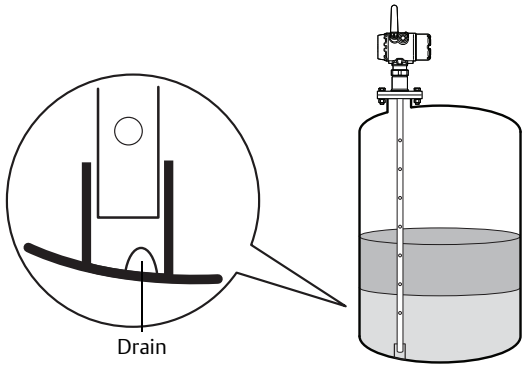
The coaxial probe can be secured to the tank wall by fixtures fastened to the tank wall. Fixtures are customer supplied. Make sure the probe can move freely due to thermal expansion without getting stuck in the fixture.

Figure 3-11. Coaxial Probe Secured to the Tank Wall



The coaxial probe can be guided by a tube welded on the tank bottom. Tubes are customer supplied. Make sure that the probe can move freely in order to handle thermal expansion. The measurement accuracy will be reduced close to the tube opening.

Figure 3-12. Coaxial Probe with Tube



3.6 Mount device on tank

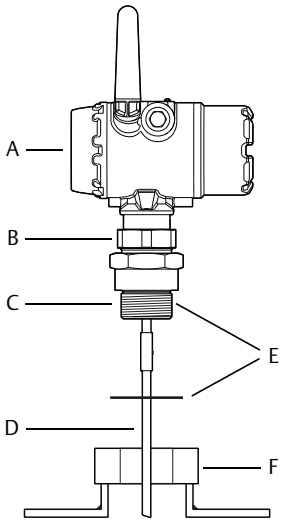
Mount the transmitter with flange on a nozzle on top of the tank. The transmitter can also be mounted on a threaded connection. Make sure only qualified personnel perform the installation.

Note
If the transmitter head must be removed from the probe, make sure that the Process seal is carefully protected from dust and water. See "Transmitter head replacement" on page 99 for further information.

Note
PTFE covered probes must be handled carefully to prevent damage to the coating.

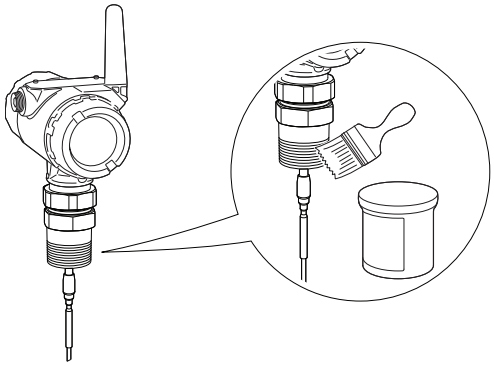
3.6.1 Threaded tank connection

Figure 3-13. Threaded Tank Connection



A. Transmitter head
B. Nut
C. Adapter
D. Probe
E. Sealant on threads (NPT) or Gasket (BSP/G)
F. Tank flange/Process connection

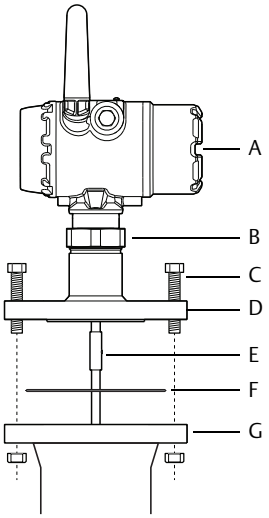
1. For adapters with BSP/G threads, place a gasket on top of the tank flange.
2. For adapters with NPT threads, use anti-seize paste or PTFE tape according to your site procedures.



3. Lower the transmitter and probe into the tank.
4. Loosen the nut that connects the transmitter head to the probe slightly.
5. Screw the adapter into the process connection.
6. Rotate the transmitter head so the device display faces the desired direction.
7. Tighten the nut. Max torque is 30 Lbft (40 Nm).
8. Continue with the grounding step.

3.6.2 Tank connection with flange

Figure 3-14. Tank Connection with Flange

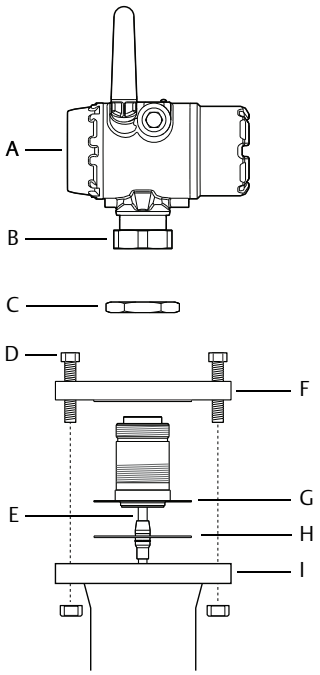


A. Transmitter head
B. Nut
C. Bolts
D. Flange
E. Probe
F. Gasket
G. Tank flange

1. Place a gasket on top of the tank flange.
2. Lower the transmitter and probe with flange into the tank.
3. Tighten the bolts.
4. Loosen the nut that connects the transmitter head to the probe slightly.
5. Rotate the transmitter head so the device display faces the desired direction.
6. Tighten the nut. Max torque is 30 Lbft (40 Nm).
7. Continue with the grounding step.

3.6.3 Tank connection with loose flange (“plate design”)

Figure 3-15. Tank Connection with Loose Flange



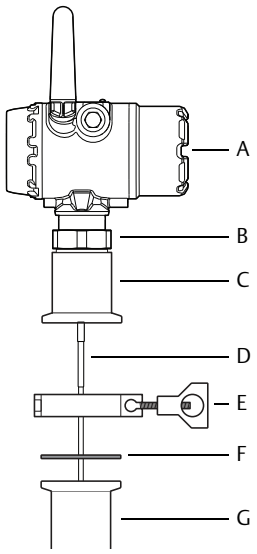
A. Transmitter head
B. Nut
C. Flange nut
D. Bolts
E. Probe
F. Loose flange
G. Plate
H. Gasket
I. Tank flange

The transmitter is delivered with head, flange and probe assembled into one unit. If, for some reason, these parts have been disassembled mount the transmitter as described below:

1. Place a gasket on top of the tank flange.
2. Mount the flange on the probe and tighten the flange nut.
3. Mount the transmitter head.
4. Lower the transmitter and probe with flange into the tank.
5. Tighten the bolts.
6. Loosen the nut that connects the transmitter head to the probe slightly.
7. Rotate the transmitter head so the device display faces the desired direction.
8. Tighten the nut. Max torque is 30 Lbft (40 Nm).
9. Continue with the grounding step.

3.6.4 Tank connection with Tri-Clamp

Figure 3-16. Tank connection with Tri-Clamp



A. Transmitter head
B. Nut
C. Tri-Clamp
D. Probe
E. Clamp
F. Gasket
G. Tank

1. Place a gasket on top of the tank flange.
2. Lower the transmitter and probe into the tank.
3. Fasten the Tri-Clamp to the tank with a clamp.
4. Loosen the nut that connects the transmitter head to the probe slightly.
5. Rotate the transmitter head so the device display faces the desired direction.
6. Tighten the nut. Max torque is 30 Lbft (40 Nm).
7. Continue with the grounding step.

3.7 Ground the device

The Rosemount 3308 Series Wireless Guided Wave Radar transmitter operates with the housing grounded or floating. Floating systems can cause extra noise that may affect many types of readout devices. If the signal appears noisy or erratic, grounding at a single point may solve the problem.

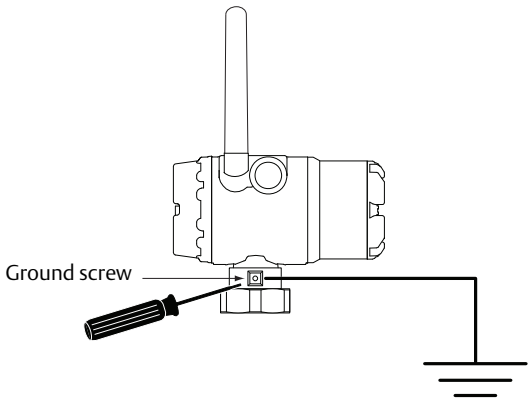
Grounding of the electronics enclosure should be done in accordance with local and national installation codes. Grounding is accomplished by using the external case grounding terminal.

Non-metallic tanks

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

There is one grounding screw connection provided, located on the housing, see Figure 3-17. The ground screw is identified by a ground symbol: ⏚

Figure 3-17. Ground Screw



Note
Always use facility recommended wiring practices.

Note
Flexible twin lead probe or coaxial probe are the recommended choice for non-metallic tanks. Single lead probes are not suited for non-metallic tanks or open atmosphere applications, due to high susceptibility to strong electromagnetic fields.

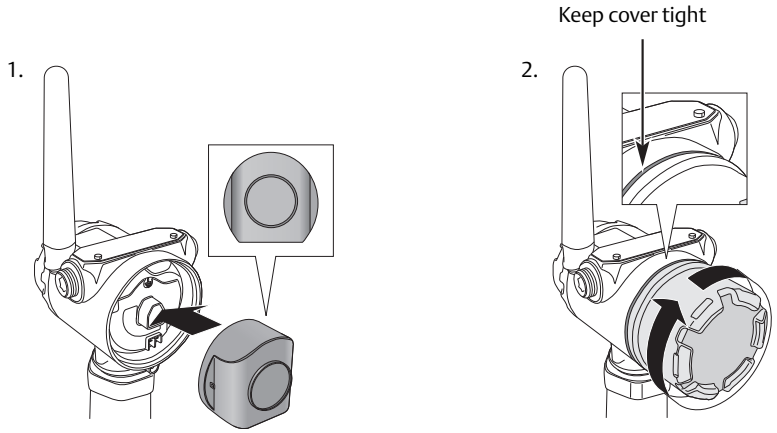
3.8 Install the power module

Note
Use caution when handling the power module, it may be damaged if dropped from heights in excess of 20 ft (6 m).

1. Install the Black Power Module, SmartPower™ Solutions model number 701PBKKF into the transmitter.

2. Close the housing cover and tighten to site or safety specifications. Always ensure a proper seal by tightening the electronics housing covers so that metal touches metal, but do not over tighten.

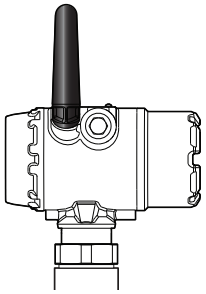
Figure 3-18. Power Module Installation



3.9 Position the antenna

The antenna should be positioned vertically, either straight up or straight down, and it should be approximately 3 ft (1 m) from any large structure, building, or conductive surface to allow for clear communication to other devices.

Figure 3-19. Antenna Positioned Vertically



3.10 Utilize the device display

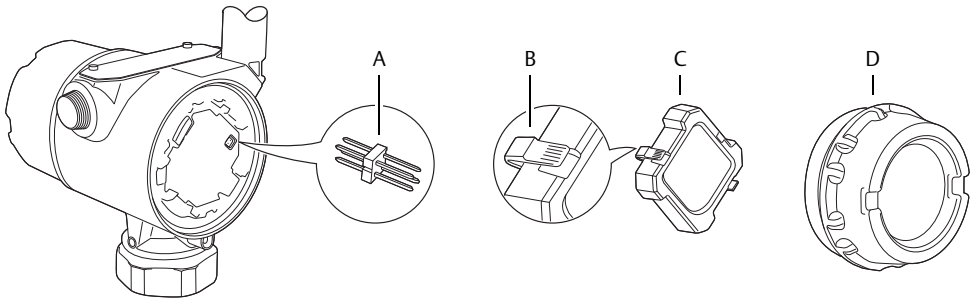
If a device display is ordered, it will be shipped attached to the transmitter. The display is ordered in the transmitter model number, option code M5.

3.10.1 Rotate the device display

To rotate the display in 90-degree increments, do the following:

1. Squeeze the two black tabs on opposite sides of the display. Refer to Figure 3-20.
2. Gently pull out the display.
3. Rotate the display to the desired orientation, and snap the display into place.

Figure 3-20. Device Display



A. Display Pins
B. Black tabs
C. Display
D. Cover

Note
If the device display four-pin connector is inadvertently removed from the interface board, carefully re-insert the connector before snapping the device display back into place.

3.10.2 Retrofitting

If an existing transmitter with no display (flat electronics cover) is to be retrofitted with a new display, order spare part kit number 00753-9004-0001(aluminum display kit) or 00753-9004-0004 (stainless steel display kit). These kits contain an extended cover with a display viewing window, a display board, and a display pin connector. Replace the flat cover with the extended display and tighten.

Section 4 Configuration

4.1 Overview

This chapter provides information about configuration, configuration tools, and configuration parameters.

- For a proper configuration, follow the steps listed in the section "Configuration procedure" on page 44.
- The configuration can be performed using one of the described configuration tools: AMS® Wireless Configurator or a Field Communicator. The section "Get started with your preferred configuration tool" on page 45 describes what preparations must be done in order to use the configuration tool.
- Appendix D: Configuration Parameters provides extended information about the configuration parameters. An overview of Device Descriptor (DD) menu is presented in the section "Menu overview of the Device Descriptor (DD)" on page 159. All configuration parameters are described in section "Configuration parameters" on page 160.

4.2 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury.

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Single lead probes are sensitive for strong electromagnetic fields and therefore not suitable for non-metallic tanks.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

⚠ WARNING

Process leaks could result in death or serious injury.

Only qualified personnel should install the equipment.

Handle the transmitter carefully.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

⚠ WARNING

To ensure long life for your radar transmitter, and to comply with hazardous location installation requirements, tighten covers on both sides of the electronics housing.

⚠ CAUTION

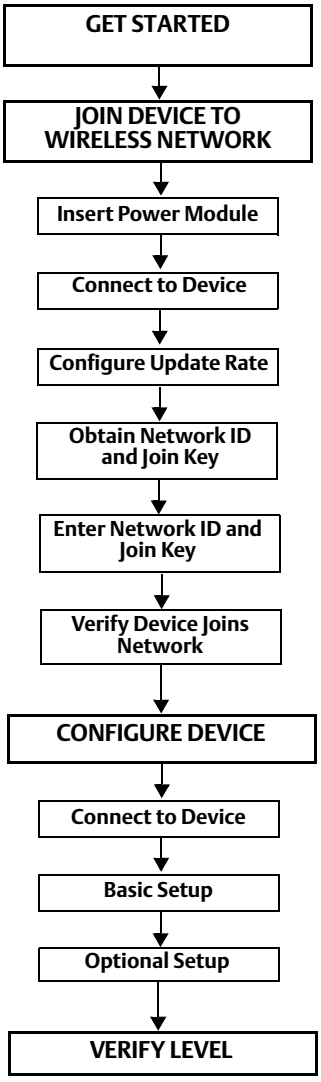
Use caution when handling the Power Module. The Power Module may be damaged if dropped from heights in excess of 20 ft (6 m).

⚠ CAUTION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

4.3 Configuration procedure

Follow these steps for proper configuration:



4.4 Get started with your preferred configuration tool

4.4.1 AMS Wireless Configurator (version 12.0 or later is required)

The AMS Wireless Configurator is the recommended software tool for the wireless network devices, and is supplied with the Smart Wireless Gateway. Refer to the AMS Wireless Configurator Manual Supplement (document number 00809-0400-4420) for further information.

Configuration can be done by connecting to the wireless network devices either point-to-point using a HART® modem as shown in Figure 4-1, or wirelessly through the gateway as shown in Figure 4-2. Initial configuration to join a device to the wireless network must be done point-to-point.

Figure 4-1. Connect Point-to-Point using HART Modem

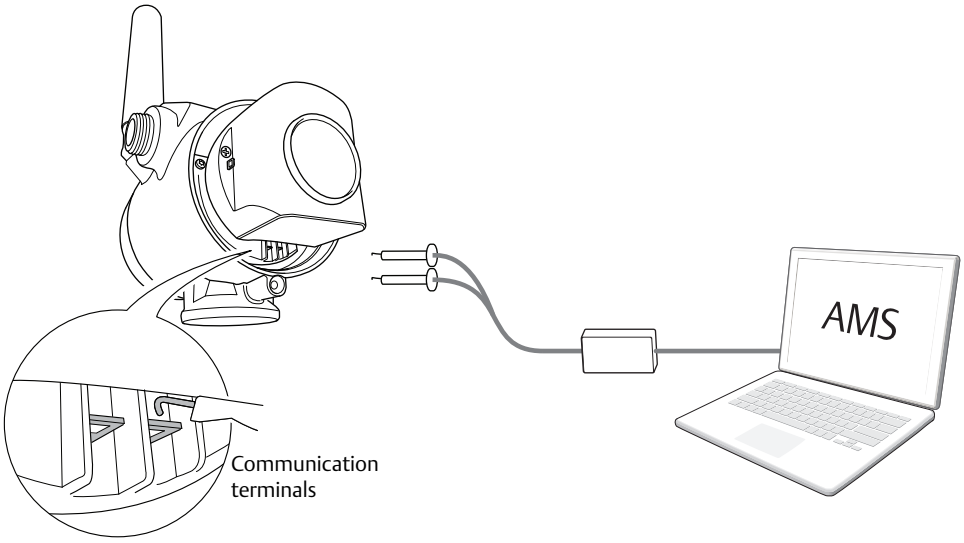
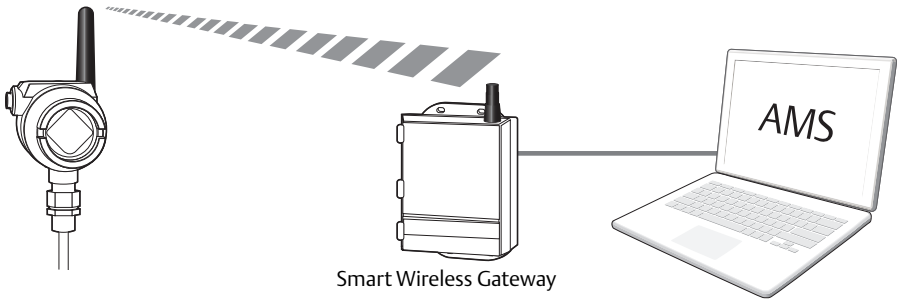


Figure 4-2. Connect Wirelessly through Smart Wireless Gateway



Get the latest Device Descriptor (DD)

The Device Descriptor (DD) is a configuration tool that is developed to assist the user through the configuration.

The Rosemount 3308 Series DD is typically installed together with AMS Wireless Configurator. To download the latest HART DD, visit the Emerson Process Management Device Install Kit site at: www.emersonprocess.com/devicefiles

After downloading, add the DD to AMS Wireless Configurator:

1. Close **AMS Wireless Configurator.**
2. Go to **Start > Programs > AMS Device Manager** and select **Add Device Type**.
3. Browse to the downloaded DD files and click **Ok**.
4. In the **Add Device Type** application, click the Help button for more information on how to complete this operation.

Configure the HART modem interface

Before connecting to the device using a HART modem, the HART modem interface must be configured in AMS Wireless Configurator:

1. Close **AMS Wireless Configurator.**
2. Go to **Start > Programs > AMS Device Manager** and select **Network Configuration**.
3. Click **Add**.
4. In the drop down list, select **HART modem** and click **Install**.
5. Follow the instructions. In the **Network Configuration** application, click the **Help** button for more information on how to complete this operation.

Configure the wireless network interface

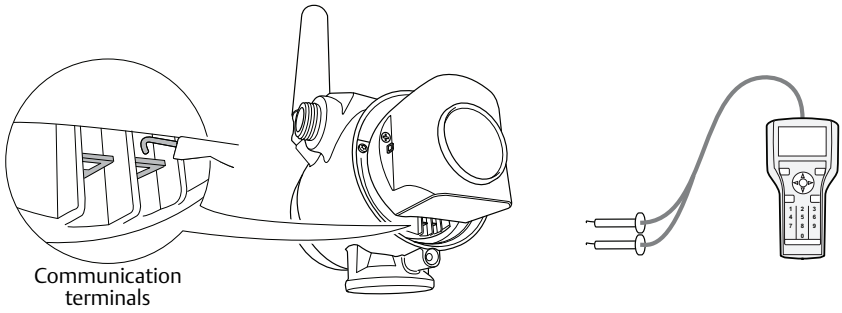
Before connecting to the device wirelessly using a Smart Wireless Gateway, the wireless network must be configured in AMS Wireless Configurator:

1. Close AMS Wireless Configurator.
2. Go to **Start > Programs > AMS Device Manager** and select **Network Configuration**.
3. Click **Add**.
4. In the drop down list select **Wireless Network** and click **Install**.
5. Follow the instructions. In the **Network Configuration** application, click the **Help** button for more information on how to complete this operation.

4.4.2 Field Communicator

This section describes how to prepare the Field Communicator to communicate with a Rosemount 3308 Series Transmitter. The Field Communicator can be used to configure the device with a point-to-point connection. Connect the leads on the Field Communicator to the communication terminals of the device as shown in Figure 4-3.

Figure 4-3. Connect Point-to-Point using a Field Communicator



An overview of the Field Communicator is shown in Figure 4-4. For information on all the capabilities, refer to the Field Communicator Product Manual (document number 00809-0100-4276).

Figure 4-4. 475 Field Communicator

A. Power key
B. Navigation keys
C. Tab key
D. Backlight key
E. Enter key
F. Function key
G. Alphanumeric keypad

Get the latest Device Descriptor (DD)

If the Rosemount 3308 Series DD is not included in your 475, then use the Easy Upgrade Utility to update the Field Communicator with the latest DD. See the Field Communicator Product Manual (document number 00809-0100-4276) for more information on how to update the device descriptors.

4.5 Join device to wireless network

4.5.1 Power up the wireless device

Make sure that the Smart Wireless Gateway is installed and functioning properly before any wireless field devices are powered. See "Install the power module" on page 38 for further information on how to install the power module.

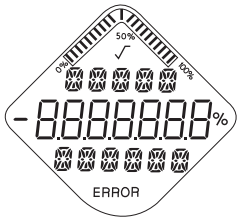
Wireless devices should be powered up in order of proximity from the Gateway, beginning with the closest. This will result in a simpler and faster network installation.

Enable Active Advertising on the Gateway to ensure that new devices join the network faster. For more information, see the Gateway Reference Manual (document number 00809-0200-4420).

Startup screen sequence

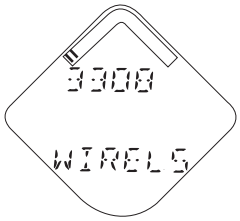
The following screens will be displayed in sequence when the power module is first connected to the Rosemount 3308 Series Transmitter.

Figure 4-5. Startup Screen Sequence



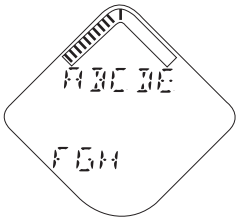
1. All Segments ON

Used to visually determine if there are any bad segments on the device display.



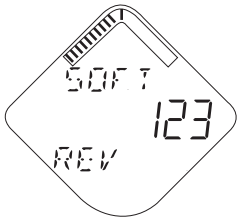
2. Device Identification

Identification string used to determine the Device Type.



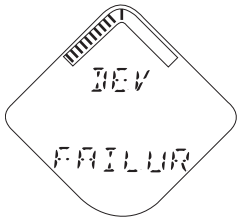
3. Device Information: Tag

User entered tag, 8 characters long. This screen will not display if all characters are blank.



4. Software Revision

Used to determine Device Software Revision.

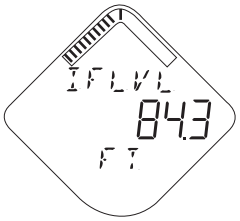


5. Device Information: Status

This screen will only appear if there is a critical error which may prevent the device from operating correctly. Check additional status screens for more information about failure source, refer to "Diagnostic button screen sequence" on page 64.

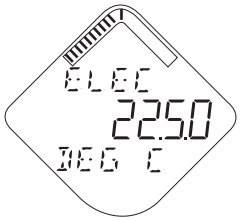
6. Primary Variable

Measurement value of mapped Primary Variable.



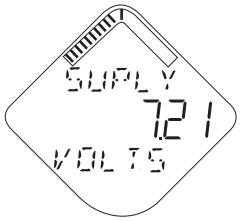
7. Secondary Variable

Measurement value of mapped Second Variable.



8. Electronics Temperature

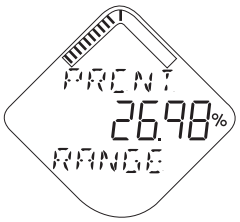
Temperature value of device electronics.



9. Supply Voltage

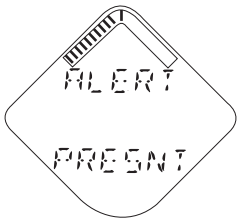
Voltage reading of the Power Module.

> 6 V	Good
5.2 V – 6.0 V	Low
< 5.2 V	Very low



10. Percent of Range

Level value in percent of total measurement range.



11. Active Alert Present

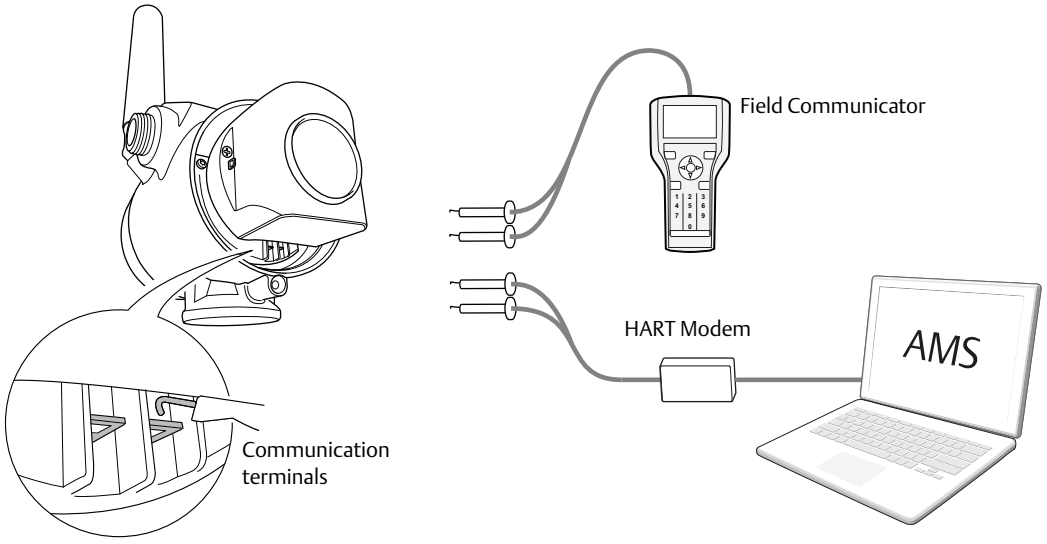
This screen will only appear if there is at least one Active Alert present. For detailed information of the failure source and recommended actions, go to the *Active Alerts* screen in AMS Wireless Configurator or Field Communicator. Refer to "Check Device Status" on page 67.

Some Active Alerts will be displayed on the LCD display as part of the diagnostic button screen sequence, refer to "Diagnostic button screen sequence" on page 64.

4.5.2 Connect to device

Connect a Field Communicator or a HART modem to the communication terminals as shown in Figure 4-6.

Figure 4-6. Connect to Device



AMS Wireless Configurator:

a. Start AMS Wireless Configurator.
b. Select **Device Connection View** in the **View** menu.
c. Double click on the device under the HART modem.

Field Communicator:

a. Turn on the Field Communicator.
b. Tap the HART symbol from the main menu.
c. The Field Communicator now connects to the device.

For more information on how to connect to device refer to "Get started with your preferred configuration tool" on page 45.

4.5.3 Configure Update Rate

The Update Rate is the frequency at which a new measurement is transmitted over the wireless network. The default update rate is 1 minute. This may be changed at commissioning, or at any time via AMS Wireless Configurator or a Field Communicator. The Update Rate is user selectable from 4 seconds to 60 minutes.

1. From the *Home* screen, select **Configure**.
2. Go to **Guided Setup** > **Wireless Setup**.
3. Click **Configure Update Rate**, and follow the instructions.

Note
Make sure to set the Update Rate so that there is enough safety margin in the system for high/low alerts. If the time between each update is too long, the high/low alerts may be triggered too late.

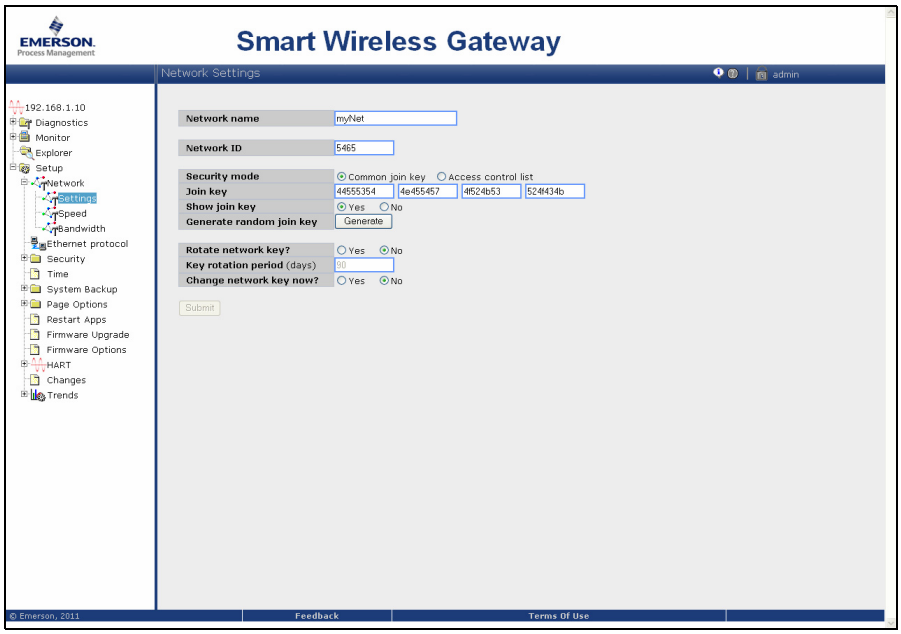
Run Check Level Response to make sure that configured Update Rate is sufficient for the application, refer to section "Optional Setup" on page 58.

4.5.4 Obtain Network ID and Join Key

In order to communicate with the Smart Wireless Gateway, and ultimately the host system, the transmitter must be configured to communicate on the wireless network. This step is the wireless equivalent of connecting wires from a transmitter to the host system.

The Network ID and Join Key may be obtained from the Smart Wireless Gateway's integrated web interface on the **Setup > Network > Settings** page, as shown in Figure 4-7.

Figure 4-7. Gateway Network Settings



4.5.5 Enter Network ID and Join Key

The devices must be configured with the same Network ID and Join Key as the Gateway in order to join the network. Use a Field Communicator or AMS Wireless Configurator to enter the **Network ID** and **Join Key** so they match the Network ID and Join Key of the Gateway.

1. From the *Home* screen, select **Configure**.
2. Go to **Guided Setup > Wireless Setup**.
3. Click **Join Device to Network**, and follow the instructions.

If the device is not to be commissioned yet, remove the power module and fasten the housing cover. This is to conserve power module life and to ensure safe transmitter transportation. The power module should be inserted only when the device is ready to be commissioned.

4.5.6 Verify device joins network

Network connection can be verified in four ways, further described in this section:

1. At the device display
2. Using the AMS Wireless Configurator
3. In the Smart Wireless Gateway's integrated web interface
4. Using the Field Communicator

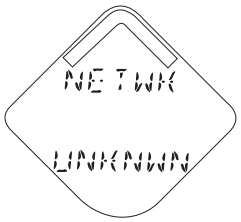
If the Rosemount 3308 Series was configured with the Network ID and Join Key, and sufficient time has passed, the transmitter should be connected to the network. It usually takes a few minutes for the device to join the network. If the device has not joined the network, please see "Wireless Network troubleshooting" on page 82.

Verify by device display

To verify that the device is connected to the network by the display, press the "DIAG" button. The display will show: the Tag, Device Serial Number, Software Revision, Network ID, Network Connection Status, and Device Status screens. Refer to "Diagnostic button screen sequence" on page 64.

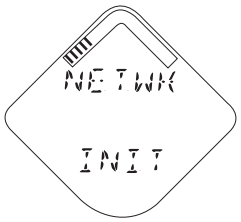
When the network diagnostic status is displayed as "NETWK OK", the device has successfully joined the network. When joining the wireless network, the status displayed will be changed through the sequence until the device finally has joined the network. Figure 4-8 on page 54 presents the different network connection status screens.

Figure 4-8. Network Connection Status Screens



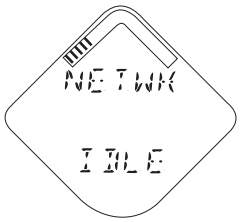
Network Unknown

The device is still in the process of being activated.



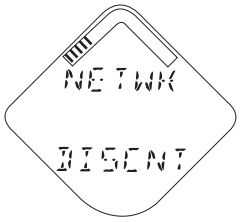
Network Restarted

The device has just restarted.



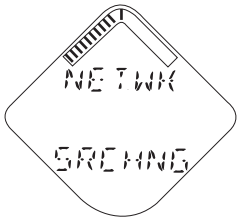
Network Idle

The device is starting to join the process.



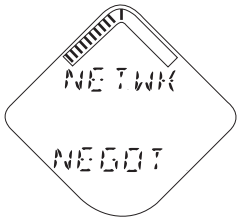
Disconnected from Network

The device is in a disconnected state and requires a “Force Join” command to join the network.



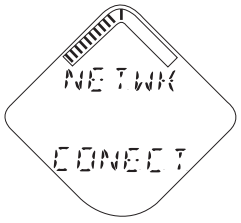
Searching for Network

The device is searching for the network.



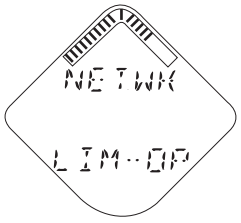
Joining the Network

The device is attempting to join the network.



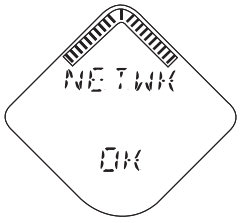
Connected but in a “quarantined” state

The device is connected to the network, but is in a “quarantined” state.



Connected with Limited Bandwidth

The device is joined and operational, but is running with limited bandwidth for sending periodic data.



Connected

The device has successfully joined the network.

Verify with AMS Wireless Configurator

Start the AMS Wireless Configurator. When the device has joined the network, it will appear in the AMS Wireless Configurator window as illustrated in Figure 4-9.

Figure 4-9. AMS Wireless Configurator Screen

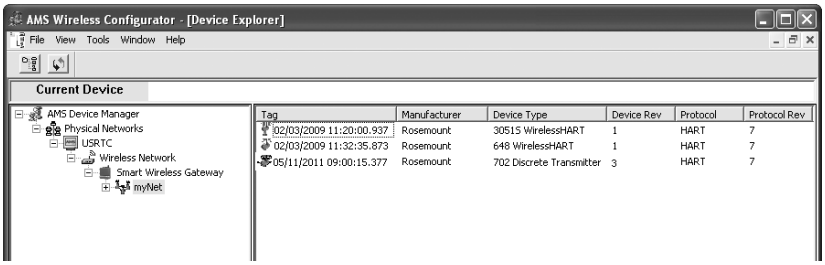
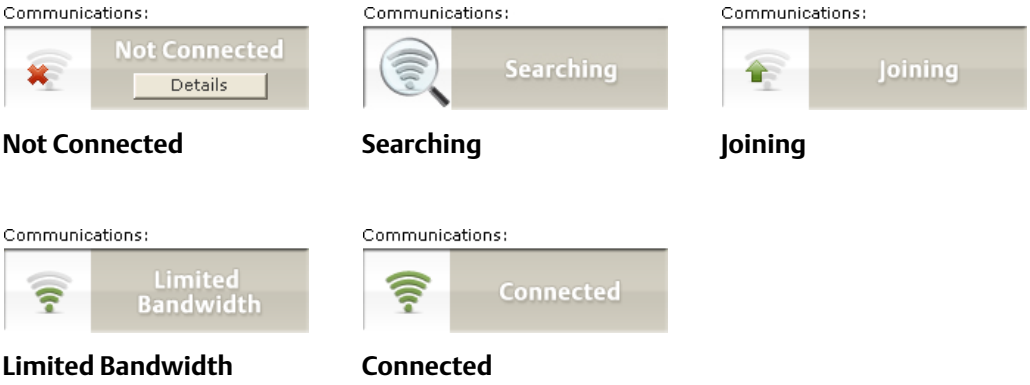


Figure 4-10 presents the different network connection status images that are shown in the AMS Wireless Configurator *Overview* screen.

Figure 4-10. Network Connection Status Images



Not Connected **Searching** **Joining**

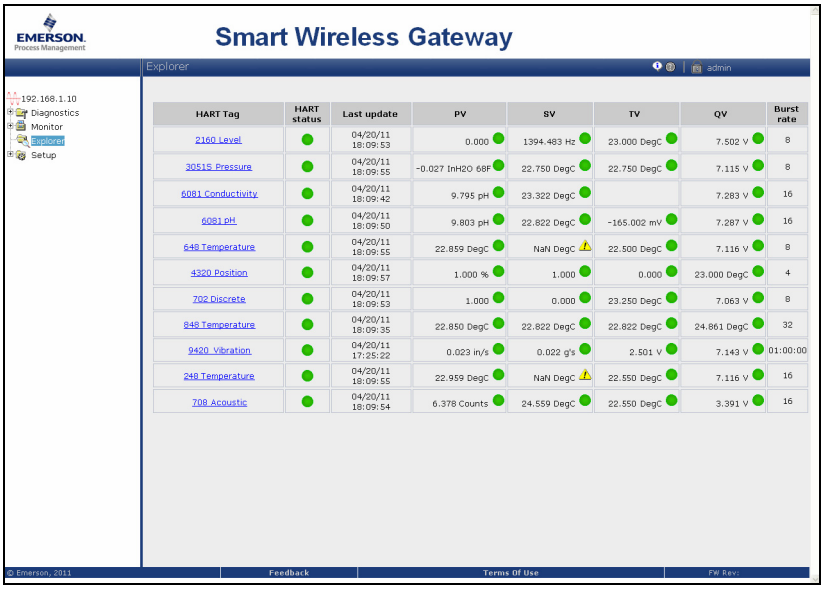
Limited Bandwidth **Connected**

Verify by Gateway

To use the Smart Wireless Gateway's integrated web interface, navigate to the **Explorer > Status** page as shown in Figure 4-11. This page shows whether the device has joined the network and if it is communicating properly.

Locate the device in question and verify all status indicators are good (green). It may take several minutes for the device to join the network and be seen on the Gateway's integrated web interface.

Figure 4-11. Smart Wireless Gateway Explorer Status Page



Verify with Field Communicator

Connect the Field Communicator as shown in Figure 4-6 on page 50. Do not remove the power module. Removing the power module may cause the device to drop off the network.

Note
In order to communicate with a Field Communicator, the device must be powered by the power module.

To verify the device has joined the network, do the following:

1. From the *Home* screen, select **Service Tools > Communications**.
2. Click **Join Status**, and follow the instructions.

4.6 Configure device using Guided Setup

4.6.1 Connect to device

Connect to the device using your preferred configuration tool, as shown in Figure 4-12 and Figure 4-13.

AMS Wireless Configurator:

a. Start AMS Wireless Configurator.
b. Select **Device Connection View** in the **View** menu.
c. Double click on the device under the HART modem.

Field Communicator:

a. Turn on the Field Communicator.
b. Tap the HART symbol from the main menu.
c. The Field Communicator now connects to the device.

Figure 4-12. Connect to Device - Point-to-Point

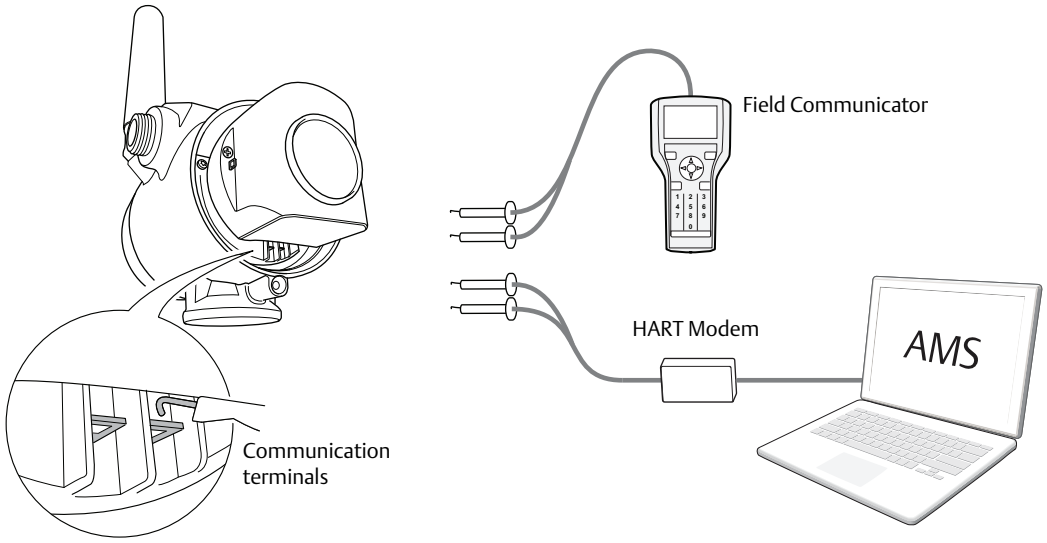
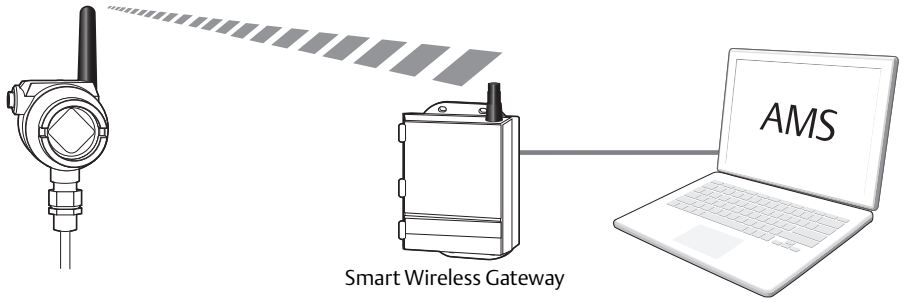


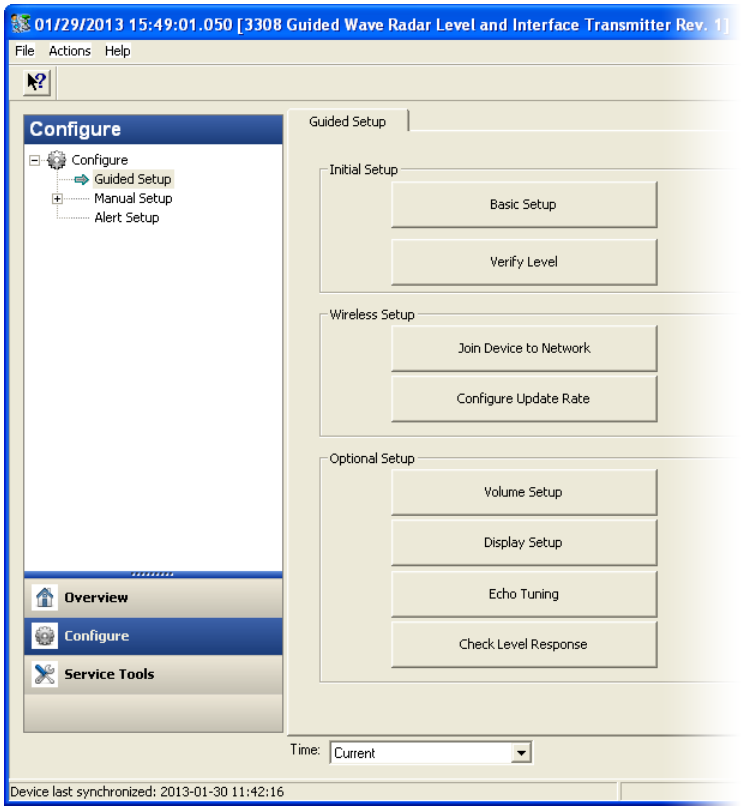
Figure 4-13. Connect to Device - Wirelessly



4.6.2 Basic Setup

All Basic Setup parameters are described in the section "Configuration parameters" on page 160.

Figure 4-14. Guided Setup Screen



1. From the *Home* screen, select **Configure**.
2. Go to **Guided Setup > Initial Setup**.
3. Click **Basic Setup**, and follow the instructions.

4.6.3 Optional Setup

Consider Optional Setup such as Volume, Device Display, Echo Tuning, and Check Level Response, found in the Guided Setup. Run Check Level Response to review the maximum level change between updates with the current configuration.

1. From the *Home* screen, select **Configure**.
2. Go to **Guided Setup > Optional Setup**.
3. Click the selected Optional Setup, and follow the instructions.

Additional configuration parameters are available in the Manual Setup menu. For further information about the parameters see "Configuration parameters" on page 160.

4.7 Verify Level

Run the Verify Level tool to match the product level reported by the device to a reference measurement (measured by using for example handgauging). If any difference, the Calibration Offset parameter will be adjusted as shown in Figure 4-15.

A minor adjustment using Calibration Offset is normal. There may, for example be a deviation between the actual tank height and the configured value.

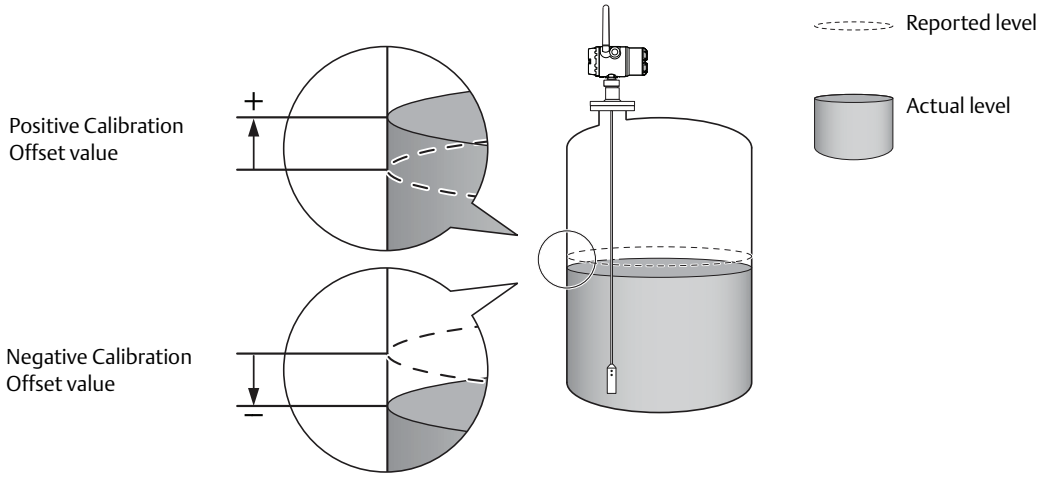
Non-metallic (e.g. plastic) vessels and installation geometry may introduce an offset for the Upper Reference Point. This offset may be up to ± 2 in. (50 mm). The offset can be compensated for using Calibration Offset.

Note
Before running Verify Level, make sure that; the product surface is calm, the tank is not being filled or emptied, and the actual level is well above the probe end.

To run Verify Level, do the following:

1. From the *Home* screen, select **Configure**.
2. Go to **Guided Setup > Initial Setup**.
3. Click **Verify Level** to check your level measurement, and follow the instructions.

Figure 4-15. Calibration Offset



Section 5 Operation

5.1 Safety messages

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Explosions could result in death or serious injury.

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Single lead probes are sensitive for strong electromagnetic fields and therefore not suitable for non-metallic tanks.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

⚠ WARNING

Process leaks could result in death or serious injury.

Handle the transmitter carefully.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

Only qualified personnel should install the equipment.

Do not remove the transmitter while in operation.

⚠ WARNING

To ensure long life for your radar transmitter, and to comply with hazardous location installation requirements, tighten covers on both sides of the electronics housing.

⚠ CAUTION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

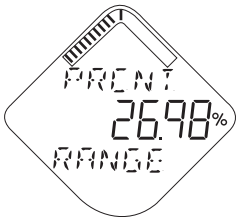
5.2 Device display screen messages

The device display can be used to present different variables and a diagnostic screen sequence.

5.2.1 Variable screens

If the Display Mode is set to Periodic, the device display shows a periodic sequence of user-chosen variables during operation. A new screen appears according to configured wireless update rate. The device display will also show ALERT PRESNT if at least one alert is present. For information on how to configure the device display, see "Device Display" on page 165.

The Rosemount 3308 Series Transmitter can display the following variables.

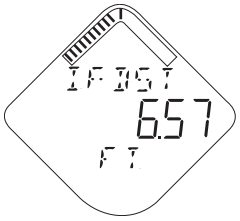


Percent of Range

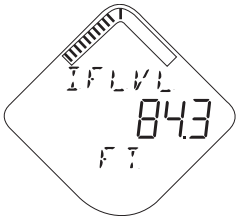
Level

Distance

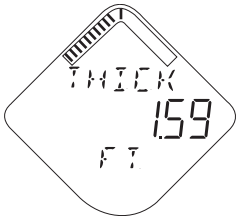
Total Volume



Interface Distance

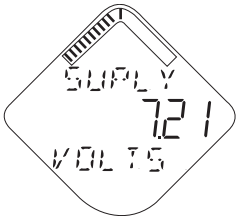


Interface Level



Upper Product Thickness

Electronics Temperature



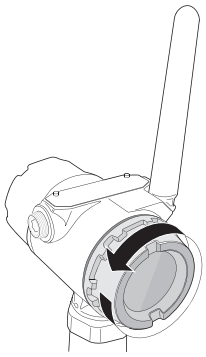
Supply Voltage

Signal Quality

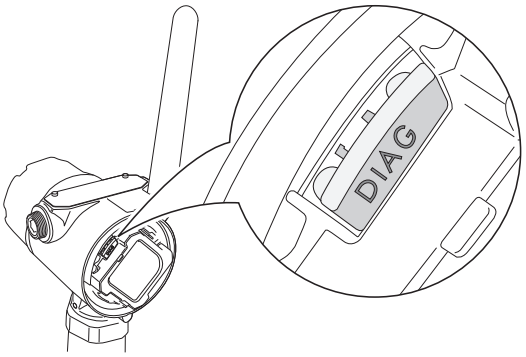
5.2.2 Diagnostic button screen sequence

The diagnostic button screen sequence on the device display can be used to obtain detailed diagnostic information. Do the following:

1. Unscrew the device display cover.

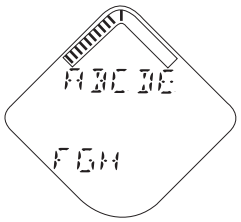


2. Press and hold the “DIAG” button until the first diagnostic button screen appears on the device display. Then release the “DIAG” button.



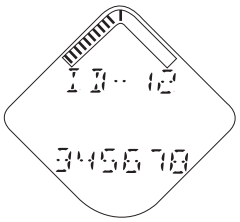
3. The device display will now automatically show the diagnostic screens as illustrated in Figure 5-1.

Figure 5-1. Diagnostic Button Screen Sequence



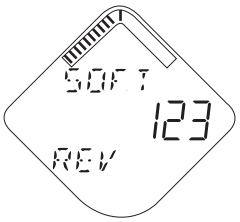
1. Device Information: Tag

User entered tag which is 8 characters long. This screen will not display if all characters are blank.



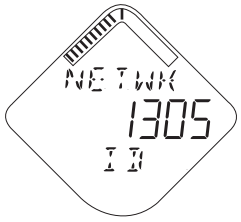
2. Device Serial Number

Used to determine Device Serial Number.



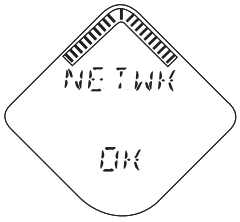
3. Software Revision

Used to determine Device Software Revision.



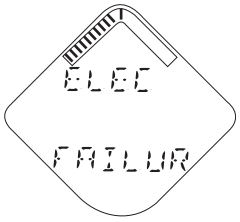
4. Network ID

Used to determine the entered Network ID in the device.



5. Network Connection Status

The screen displayed is dependent on the progress of the device in joining the wireless network. See Figure 4-8 on page 54 for more information.

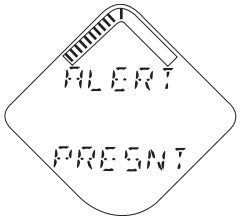


6. Active Alert Screens (if present)

See "Device display alerts" on page 72 for a full list of Active Alerts that may appear on this position of the sequence.

7.Variable Screens

At the end of the sequence, the device display shows all selected variable screens.



8. Active Alert Present

This screen will only appear if there is at least one Active Alert present. For detailed information of the failure source and recommended actions, go to the *Active Alerts* screen in AMS® Wireless Configurator or Field Communicator. Refer to "Check Device Status" on page 67.

5.3 View measurement values

Measurement values can be viewed using AMS Wireless Configurator and Field Communicator.

5.3.1 View current measurement values

Current measurement data of the Primary Variable (PV) and Secondary Variable (SV) are presented on the **Overview** screen. To view all current measurement values, do the following:

1. From the *Home* Screen, go to **Service Tools > Variables**.
2. Select the desired group of measurement values to view.
   - To view gauges for the Primary Variable (PV), Secondary Variable (SV), Third Variable (TV) and Fourth variable (QV), click **Mapped Variables**.
   - To view process values such as Level, Distance, Percent of Range, click **Process**.
   - To view device values such as Electronics Temperature, Supply Voltage, click **Device**.
   - To view Signal Quality, click **Signal Quality**.

5.3.2 View trends

1. From the *Home* Screen, go to **Service Tools > Trends**.
2. Select to log measurement values either in a graph or a table.
   - To log Level and Interface Level values in a graph, click **Level**.
   - To log Distance values in a graph, click **Distance**.
   - To log Total Volume in a graph, click **Volume**.
   - To log Signal Quality in a graph, click **Signal Quality**.
   - To log the trend of 12 data points shown in a table, click **Data History**, and then click **View Data History**. See "Configure Data History" on page 166 for information on how to configure device variable for recording and time between samples.

Note
Values are logged in the trend graphs only as long as the **Trends** item is selected.

5.3.3 Interpret measurement status bars

A "Good" or "Bad" status next to a value is an indication of the reliability or integrity of the data being received, not an indication of whether or not the value is within the configured upper or lower ranges. A value that triggers an alert, such as a high or low temperature indication, will change the overall status of the device, but the measurement might still be indicated as "Good" if the reliability of the data is good.

Figure 5-2. Measurement Status Bars

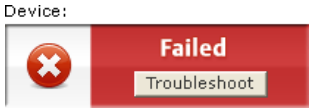
5.4 Check Device Status

The overall device status is presented in AMS Wireless Configurator and Field Communicator under the **Overview** screen. The Rosemount 3308 Series reports diagnostic alerts when there is a device malfunction. For information on these alerts, see "Alert messages in AMS Wireless Configurator and Field Communicator" on page 74. The device can also be configured to report user defined alerts based on the measured variables, see "Alert Setup" on page 173 for more information.

To check device status and see whether there are any Active Alerts reported, do one of the following:

- The overall device status is presented in the **Overview** screen. If status is anything than *Good*, click the button in the device status image to open a window with Active Alerts. The different device status images can be found in Table 5-1.
- Active Alerts can also be obtained via **Service Tools > Active Alerts**.

Table 5-1. Presentation of Device Status Images

Device Status Image	Condition
	*Good*: No active alert.
	*Failed*: At least one Failure Alert is active. Click the **Troubleshoot** button to open a window with Active Alerts together with recommended actions.
	*Maintenance*: At least one Maintenance Alert is active (and no Failed alerts). Click the **Investigate** button to open a window with Active Alerts together with recommended actions.
	*Advisory*: At least one Advisory Alert is active (and no Failed or Maintenance Alerts). Click the **Investigate** button to open a window with Active Alerts together with recommended actions.

Section 6 Service and Troubleshooting

6.1 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury.

Make sure the transmitter is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

⚠ WARNING

Explosions could result in death or serious injury.

Verify the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Single lead probes are sensitive for strong electromagnetic fields and therefore not suitable for non-metallic tanks.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

⚠ WARNING

Process leaks could result in death or serious injury.

Only qualified personnel should install the equipment.

Install transmitter prior to process start-up.

Install and tighten process connectors before applying pressure.

Handle the transmitter carefully.

Do not remove the transmitter while in operation.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

⚠ WARNING

To ensure long life for your radar transmitter, and to comply with hazardous location installation requirements, tighten covers on both sides of the electronics housing.

⚠ WARNING

Any substitution of non-recognized parts may jeopardize safety. Repair, e.g. substitution of components etc., may also jeopardize safety and is under no circumstances allowed.

⚠ CAUTION

Use caution when handling the Power Module. The Power Module may be damaged if dropped from heights in excess of 20 ft (6 m).

⚠ CAUTION

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference. This device must accept any interference received, including interference that may cause undesired operation. This device must be installed to ensure a minimum antenna separation distance of 20 cm (8 in.) from all persons.

6.2 Alert messages

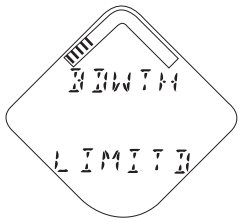
6.2.1 Device display alerts

The following active alert screens will show the device diagnostics depending on the state of the device.

If the device display shows ALERT PRESNT but none of the following screens appear, then go to the *Active Alerts* screen in AMS® Wireless Configurator or Field Communicator for further information.

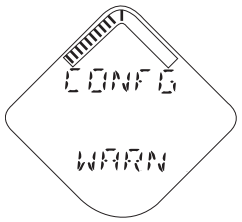
For detailed information of the failure source and recommended actions, go to the *Active Alerts* screen in AMS Wireless Configurator or Field Communicator, see “Alert messages in AMS Wireless Configurator and Field Communicator” on page 74.

Figure 6-1. Active Alerts Screens



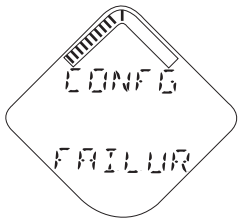
Bandwidth Limited

The device has not yet received all of the requested wireless bandwidth needed to operate as configured. See "Wireless Network troubleshooting" on page 82 for recommended actions.



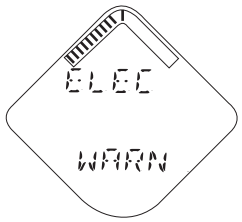
Configuration Warning

The device has detected a configuration error. Non-critical operation of the device may be affected.



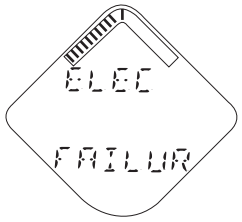
Configuration Failure

The device has detected a configuration error. Critical operation of the device may be affected.



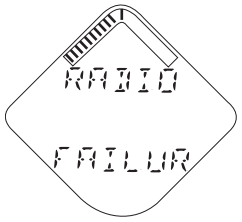
Electronics Warning

There is a warning which should be addressed but should not affect the device output.



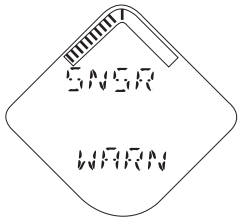
Electronics Failure

An electronics error that could impact the device measurement reading has occurred.



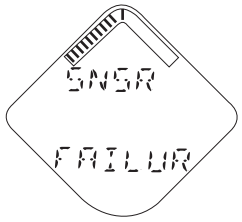
Radio Failure

The wireless radio has detected a failure or stopped communicating.



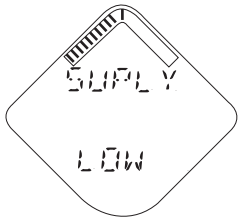
Sensor Warning

A sensor attached to the transmitter is degraded. Readings from that sensor may not be within accuracy specifications.



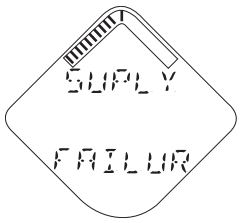
Sensor Failure

A sensor attached to the transmitter has failed, and valid readings from that sensor are no longer possible.



Supply Voltage Low

The voltage is below the recommended operating range. Replace the Power Module, see "Power module replacement" on page 97.



Supply Voltage Failure

The supply voltage is too low and will affect device operation. Replace the Power Module, see "Power module replacement" on page 97.

6.2.2 Alert messages in AMS Wireless Configurator and Field Communicator

Table 6-1 to Table 6-4 shows list of alert messages that may be displayed in the AMS Wireless Configurator and Field Communicator.

To view Active Alerts, do the following:

- From the *Home* Screen, go to **Service Tools > Active Alerts**.

Table 6-1. Failure Alerts (F:)

Message	Description	Recommended actions
Electronics Failure	An electronics error that could impact the device measurement reading has occurred.	1. Restart the device. 2. Restore default settings and reconfigure the device. 3. If the condition persists, replace the device.
Radio Failure	The wireless radio has detected a failure or stopped communicating.	1. Restart the device. 2. If the condition persists, replace the device.
Supply Voltage Failure	The supply voltage is too low and will affect device operation.	1. Replace the Power Module, see "Power module replacement" on page 97.
Probe Disconnected	The device cannot detect the probe.	1. Check that the probe connection is properly tightened. 2. Check that the probe connection is dry and clean. 3. Restart level measurements. 4. If the condition persists, replace the device and/or the probe.
Electronics Temperature Critical	The internal temperature of the device has reached critical levels and the integrity of the device electronics may be compromised. Environmental temperature should not exceed device specifications.	1. Verify that ambient temperature is within the specified range. For more information about the maximum ambient temperature, see "Temperature limits" on page 103. 2. Remote mount the transmitter head away from the process and environmental conditions. 3. Restart the device. 4. If the condition persists, replace the device.
Remote Housing Error	The device has detected a problem associated with the remote housing.	1. Correct remote housing configuration to match connected remote housing cable. 2. Check remote housing cable.
Configuration Error	The device has detected a configuration error. Reasons may be multiple. See Table 6-2 for a list of detailed Configuration Errors that may be displayed.	1. Click on the Details button for more information. 2. Correct the parameter causing the configuration error.

Table 6-2. Configuration Error Details (D:)

Message	Description	Recommended actions
Lower Range Value or Upper Range Value is out of limits	The lower/upper range value is outside the lower/upper sensor limits. This is outside the range where the sensor works properly, hence the measurement may be unreliable.	1. Check the lower and upper range values in relation to the sensor limits.
Configured Measurement Mode not Supported	The configured Measurement Mode does not work since support has not been purchased.	1. Upgrade the device. 2. Change the Measurement Mode to match, refer to "Measurement Mode" on page 162.
Volume Configuration Error	The volume cannot be calculated correctly with the current configuration.	1. Check that the level-volume values in the strapping table are entered in increasing order, refer to "Strapping Table" on page 172. 2. Check that the number of strapping points to use is correct. 3. Check size measures in the Volume Setup.
Parameter Out of Limits	One or more of the configuration values, in a set that belongs together, has been changed and reduced the measurement range of the device.	1. Check the configured values for Probe Length, Vapor Dielectric Constant, and Upper Product Dielectric Constant. 2. Restore default settings and reconfigure the device.
Low Low Level Alert configuration is invalid	Low Low Level Alerts will not be raised as expected because of invalid configuration.	1. Check entered limit and deadband values in comparison with entered tank and probe parameters such as probe length, tank height etc.
Low Level Alert configuration is invalid	Low Level Alerts will not be raised as expected because of invalid configuration.	1. Check entered limit and deadband values in comparison with entered tank and probe parameters such as probe length, tank height etc.
High Level Alert configuration is invalid	High Level Alerts will not be raised as expected because of invalid configuration.	1. Check entered limit and deadband values in comparison with entered tank and probe parameters such as probe length, tank height etc.
High High Level Alert configuration is invalid	High High Level Alerts will not be raised as expected because of invalid configuration.	1. Check entered limit and deadband values in comparison with entered tank and probe parameters such as probe length, tank height etc.
User Defined Alert configuration is invalid	User Defined Alerts will not be raised as expected because of invalid configuration.	1. Check entered limit and deadband values in relation to the selected variable.
Signal Quality Alert configuration is invalid	Signal Quality Alerts will not be raised as expected because of invalid configuration.	1. Check entered limit and deadband values regarding their range [0.1 – 10.0] and mutual relationship.
No user configuration errors detected	No user configuration errors detected.	

Table 6-3. Maintenance Alerts (M:)

Message	Description	Recommended actions
Supply Voltage Low	The supply voltage is low and may affect Device Operation.	1. Replace the Power Module, see "Power module replacement" on page 97.
Electronics Temperature Out of Limits	The temperature of the electronics board has exceeded the transmitter's operating range.	1. Verify that ambient temperature is within the operating range. 2. Restart the device. 3. Remote mount the transmitter head away from the process and environmental conditions. 4. If the condition persists, replace the device.
Level Measurement Lost	No valid Level reading. Reasons may be multiple: - No valid surface echo peak in the measuring range. - Incorrect transmitter configuration.	1. Analyze the Echo Curve for reason and check device configuration, especially thresholds, Near Zone, Maximum Level Rate and settings on the Lost Measurement tab in the Alert Setup. 2. Check device physical installation (for instance probe contamination). 3. Restart level measurement. 4. Restore default settings and reconfigure the device. 5. If the condition persists, replace the device.
Simulation Active	The device is in simulation mode and is not reporting actual information.	1. If this behavior is not desired, stop simulation mode. 2. If the condition persists, restart level measurements.
Low Signal Quality	The Signal Quality is below the defined alert limit.	1. Take action based on your intended use of this alert. 2. Clean the probe. 3. If no actions were necessary, consider to change the limit.

Table 6-4. Advisory Alerts (A:)

Message	Description	Recommended actions
Database Memory Warning	The device has failed to write to the database memory at some time in the past. Any data written during this time may have been lost.	1. If logging dynamic data is not needed, this advisory alert can be safely ignored. 2. Restart the device. 3. Reconfirm all configuration items in the device. 4. Restore default settings and reconfigure the device. 5. If the condition persists, replace the device.
Non-Critical User Data Warning	A user written parameter does not match expected value.	1. Restart the device. 2. Reconfirm all configuration items in the device. 3. Restore default settings and reconfigure the device. 4. If the condition persists, replace the device.
Volume Range Warning	The level measurement is outside the configured volume range.	1. Check volume configuration.
Button Stuck	The button on the Electronics Board is detected as stuck in the active position.	1. Check the buttons for obstructions. 2. If the condition persists, restart the device. 3. If the condition persists, replace the device.
HiHi Level Alert	The level is above the defined limit.	1. Bring the system to a safe state. 2. Verify that the level is within specified limits. 3. Reconfirm the level alert limit. 4. If not needed, disable this alert.
Hi Level Alert	The level is above the defined limit.	1. Bring the system to a safe state. 2. Verify that the level is within specified limits. 3. Reconfirm the level alert limit. 4. If not needed, disable this alert.
Lo Level Alert	The level is below the defined limit.	1. Bring the system to a safe state. 2. Verify that the level is within specified limits. 3. Reconfirm the level alert limit. 4. If not needed, disable this alert.
LoLo Level Alert	The level is below the defined limit.	1. Bring the system to a safe state. 2. Verify that the level is within specified limits. 3. Reconfirm the level alert limit. 4. If not needed, disable this alert.
User Defined Alert	The variable has surpassed the user defined limit.	1. Bring the system to a safe state. 2. Verify that the process variable is within user specified limits. 3. Reconfirm the user defined alarm limit. 4. If not needed, disable this alert.

6.3 Troubleshooting guide

If there is a malfunction despite the absence of alerts, see Table 6.3.1 for information on possible causes and recommended actions.

The troubleshooting guide contains the following symptoms:

- Incorrect level readings, see page 78.
- Incorrect or missing interface level reading, see page 80.
- Power module troubleshooting, see page 81.
- Device display troubleshooting, see page 81.
- Wireless Network troubleshooting, see page 82.

6.3.1 Incorrect level readings

Symptom	Possible cause and recommended actions
The level readings do not correspond to a reference measurement, for example a handgauged value.	■ Check the Tank Height parameter, refer to "Tank Height" on page 161. ■ Check Thresholds, refer to "Adjusting thresholds" on page 84. ■ Run Verify Level, see "Verify Level" on page 59. ■ Check transmitter configuration. Run Basic Setup, refer to "Basic Setup" on page 58.
There is no level reading.	■ The tank is empty. No action is needed. ■ Check Thresholds, refer to "Adjusting thresholds" on page 84.
Level spikes or level is suddenly reported as full or empty.	■ Check the Upper Product Dielectric Constant, see "Upper Product Dielectric Constant" on page 163. ■ The transmitter is configured with wrong Probe Type, refer to "Probe Type" on page 161. ■ Check Thresholds, see "Adjusting thresholds" on page 84. ■ The transmitter has locked on disturbing obstacles at top of the tank. See "Handling disturbances at the top of the tank" on page 92 for recommended actions. ■ The surface is turbulent. Set the Performance Mode to High to get a stable measurement signal, refer to "Noise or weak surface echoes" on page 97.

Symptom	Possible cause and recommended actions
Level stuck in full.	■ The tank is full. Check the product level. ■ Check Thresholds, see "Adjusting thresholds" on page 84. ■ The transmitter has locked on disturbing obstacles at top of the tank. See "Handling disturbances at the top of the tank" on page 92 for recommended actions. ■ The transmitter is configured with wrong Probe Type, refer to "Probe Type" on page 161. ■ The reference peak is not detected since it is weaker than the Reference Threshold. Adjust Reference Threshold to an appropriate value so that reference peak is not filtered out. Refer to "Adjusting thresholds" on page 84.
Level stuck in measuring range.	■ May be caused by a disturbing object in the tank. Read the Echo Curve and adjust Thresholds, see "Adjusting thresholds" on page 84. ■ Check if the probe is bent and in contact with the tank wall. This contact causes a false echo reading. ■ Heavy coating or contamination on the probe. Clean the probe.
Level stuck in empty.	■ Thresholds may be too high, see "Adjusting thresholds" on page 84.
Level fluctuations (a couple of inches).	■ There is too much disturbing noise in the tank (from foam, splashing etc.). Set the Performance Mode to High to get a stable measurement signal, refer to "Noise or weak surface echoes" on page 97. ■ There are rapid level changes in the tank. Select a faster Update Rate, refer to "Configure Update Rate" on page 51. ■ Thin oil layer on top of water that is sometimes detected, sometimes not. Set the Peak Detection Method to Threshold Intersection to improve the stability of level measurements in such applications. Refer to "Resolving thin oil layers" on page 91.

6.3.2 Incorrect or missing interface level reading

Symptom	Possible cause and recommended actions
Incorrect Interface Level reading.	■ The Upper Product Dielectric Constant is not correct, see "Upper Product Dielectric Constant" on page 163. ■ Air gap is too big when the Measurement Mode is set to Interface Level with Submerged Probe. Reduce air gap or switch the Measurement Mode to Product Level and Interface Level.
Missing Interface Level reading (reported as NaN).	■ The Measurement Mode is set to Product Level. Set Measurement Mode to Product Level and Interface Level, refer to "Measurement Mode" on page 162. ■ The Interface Peak is difficult to detect, because the bottom product has a low dielectric constant, or the signal is attenuated in the upper product. Check Thresholds. For more information, see "Example 2: Interface Peak not found" on page 88.
There are two products in the tank, but only the product surface or interface is detected.	■ The upper product is too thin to be detected. No action is needed. See "Interface measurements" on page 106 for minimum interface thickness for different probe types. ■ Check Thresholds, see "Adjusting thresholds" on page 84.
There are two products in the tank, but no readings are reported.	■ Check Thresholds, see "Adjusting thresholds" on page 84.
There is only oil in the tank but the transmitter reports water.	■ Check Thresholds, see "Adjusting thresholds" on page 84. ■ Make sure the Typical Interface Condition is set to Layer at the bottom (thin) if you typically have a thin layer at the bottom, see "Typical Interface Condition" on page 164.
There is only water in the tank but the transmitter reports oil.	■ Check Thresholds, see "Adjusting thresholds" on page 84. ■ Make sure the Typical Interface Condition is set to Layer on Top (Thin) if you typically have a thin layer at the top, see "Typical Interface Condition" on page 164.

6.3.3 Power module troubleshooting

Symptom	Possible cause and recommended actions
The Power Module seems to run out of battery very fast.	■ Consider Update Rate, refer to "Configure Update Rate" on page 51. Selecting a fast update rate has an impact on Power Module life. ■ Consider Performance Mode, refer to "Performance Mode" on page 167. The Power Module life is reduced if Performance Mode is set to High. ■ Check that Power Mode is set to Normal, see "Power Mode" on page 168. ■ Verify device is not installed in extreme temperatures. ■ Verify that device is not a network pinch point.

6.3.4 Device display troubleshooting

Symptom	Possible cause and recommended actions
The device display is not functioning.	■ Display Mode is set to Disabled. Set Display Mode to On Demand or Periodic, refer to "Display Mode" on page 165. ■ Reseat the device display according to "Utilize the device display" on page 39.

6.3.5 Wireless Network troubleshooting

Symptom	Possible cause and recommended actions
The device is not joining the wireless network.	■ Verify Network ID and Join Key. The Network ID and Join Key in the device must match the Network ID and Join Key of the Gateway, refer to "Obtain Network ID and Join Key" on page 52 and "Enter Network ID and Join Key" on page 52. ■ Enable High Speed Operation on the Smart Wireless Gateway. ■ Check Power Module. ■ Verify that Active Advertising has been enabled on the Smart Wireless Gateway. ■ Verify device is within range of at least one other wireless device or the Smart Wireless Gateway, see "Network Join Details" on page 90. ■ Verify device is configured to join. Send the "Join Now" command to the device, see "Network Join Details" on page 90. ■ See the Troubleshooting section in the Gateway Reference Manual (document number 00809-0200-4420) for more information.
Limited Bandwidth error	■ Reduce the Update Rate on transmitter, refer to "Configure Update Rate" on page 51. ■ Increase communication paths by adding more wireless points. ■ Check that device has been online for at least an hour. ■ Check that device is not routing through a "limited" routing node. ■ Create a new network with an additional Smart Wireless Gateway.

6.4 Service and troubleshooting tools

This section briefly describes tools and functions in the AMS Wireless Configurator and Field Communicator which may be useful for service and troubleshooting of Rosemount 3308 Series Transmitter.

6.4.1 Reading the Echo Curve

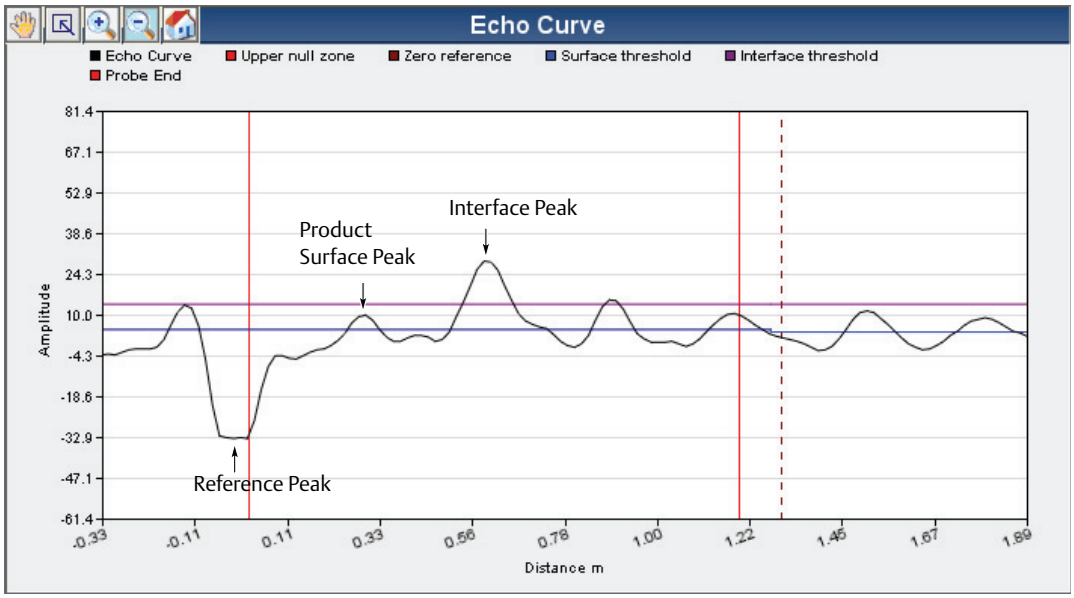
The AMS Wireless Configurator and Field Communicator have powerful tools for advanced troubleshooting. By using the Echo Curve function you get a view of the tank signal. Measurement problems can be solved by studying the position and amplitude of the different peaks.

To read the echo curve, do the following:

1. From the *Home* Screen, go to **Service Tools > Echo Tuning > Echo Curve**.
2. *AMS Wireless Configurator:* In the dialog box, click **Next >** to start reading the echo curve. The reading may take several minutes.

   Field Communicator: Click **Echo Curve** and follow the on-screen instructions. The reading may take several minutes.

Figure 6-2. Echo Curve Plot in AMS Wireless Configurator

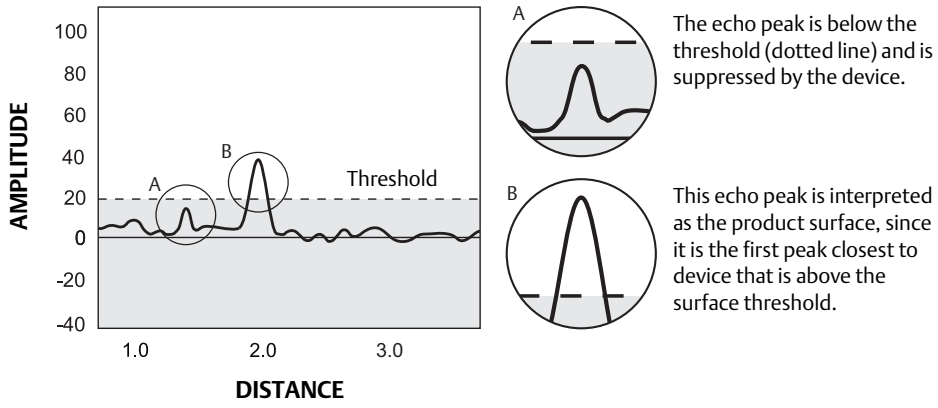


6.4.2 Adjusting thresholds

Measurement with the Rosemount 3308 is based on the fact that the radar signal pulses are reflected by the product surface and the interface between two liquids. Signal amplitude thresholds are used to separate the measurement signal from disturbing echoes and noise.

By default, the amplitude thresholds are automatically adjusted to appropriate values in order to filter out noise and other non-valid measurements from the measurement signal, as illustrated in Figure 6-3. The configured Upper Product Dielectric Constant is used for setting the automatically calculated amplitude thresholds. Normally no other threshold adjustment is needed. But if the transmitter still does not track for example the product surface, it may be necessary to manually adjust the thresholds.

Figure 6-3. Threshold Principle



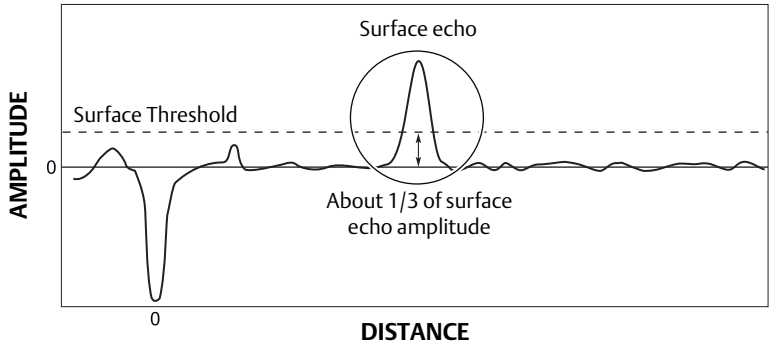
The different amplitude thresholds used for the Rosemount 3308 Series Transmitter are described in section "Thresholds" on page 176.

Note
Before changing the amplitude thresholds, check that the Upper Product Dielectric Constant parameter is set as accurately as possible. The Upper Product Dielectric Constant is used for setting the automatically calculated amplitude thresholds.

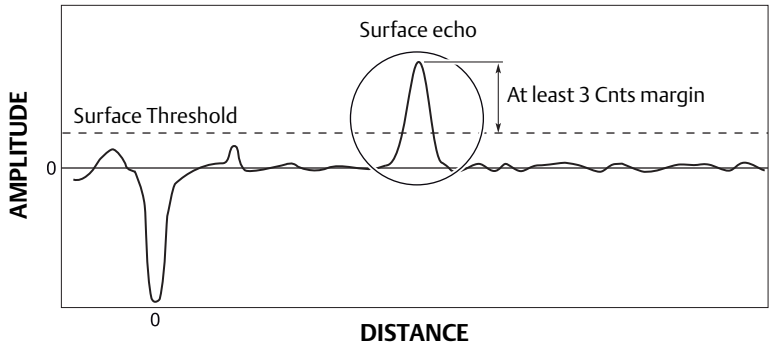
Guidelines for setting the Surface Threshold

Before changing the Surface Threshold, make sure the product level is at least 20 in. (0.5 m) from the lower side of the device flange.

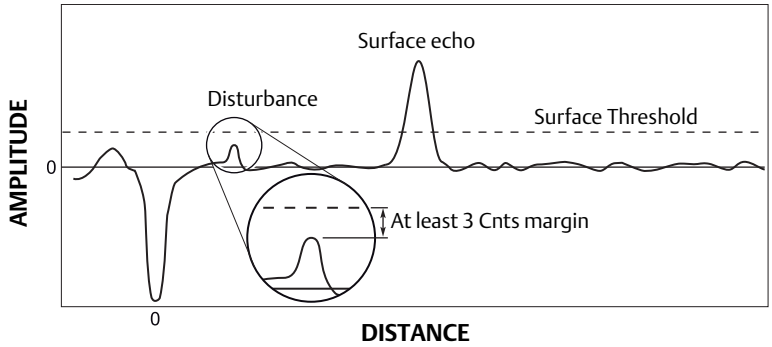
- Set the Surface Threshold to about 1/3 of the weakest surface echo amplitude in the measuring range.



- Surface Thresholds should never be set to values less than 4 Cnts.
- Make sure to include a 3 Cnts margin between the Surface Threshold and the surface echo amplitude over the entire measuring range.



- The Surface Threshold should be at least 3 Cnts greater than the amplitude of disturbances.



Contact Emerson Process Management Service Department if the transmitter is still having difficulties to track the product surface after applying the guidelines.

Guidelines for setting the Interface Threshold

- The Interface Threshold should be approximately 50% of the interface signal amplitude.
- If possible, Interface Threshold should be higher than Surface Threshold.

Procedure for adjusting thresholds

To adjust the amplitude thresholds, do the following:

1. Read the Echo Curve:
   a. Start the Echo Curve reading, refer to "Reading the Echo Curve" on page 83.
   b. View the Echo Curve plot and check the relation between amplitude threshold and corresponding signal amplitude peak.
2. Adjust the Threshold:
   a. From the *Home* Screen, go to **Service Tools > Echo Tuning > Thresholds**.
   b. Under **Threshold Control**, select **User Defined.**
   c. If using Field Communicator, click **Send**. The Threshold values can now be changed.
   d. Select desired Threshold to adjust, type the new value into the box and then click **Send**. See also "Guidelines for setting the Surface Threshold" on page 85.

Restore default thresholds

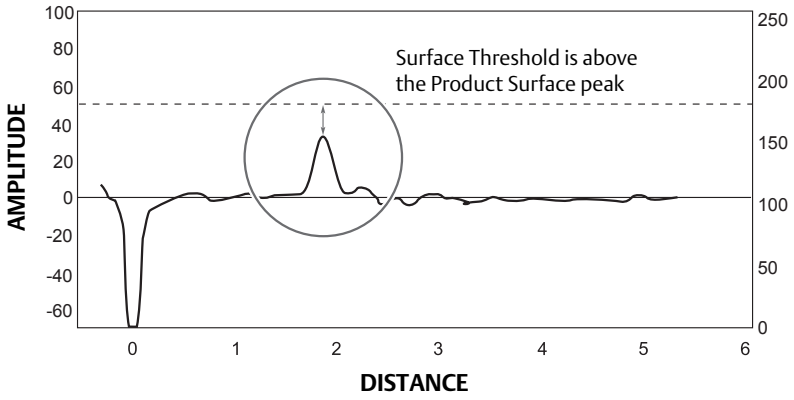
Do the following:

1. From the *Home* Screen, go to **Service Tools > Echo Tuning > Thresholds**.
2. Under **Threshold Control**, select **Default (Automatic)** and then click **Send**.

Example 1: Product Surface Peak not found

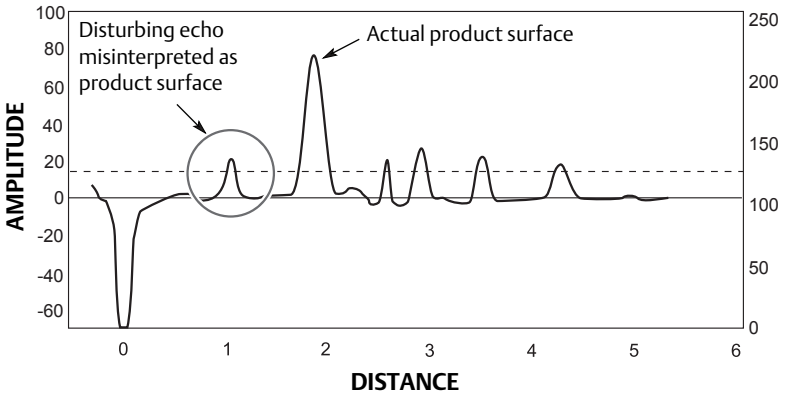
If the transmitter does not track the product surface correctly, it may be necessary to adjust the threshold values. In Figure 6-4, the Surface Threshold is too high and as a result the product level will not be detected. In a situation like this, the Surface Threshold has to be lowered so that the surface peak is not filtered out.

Figure 6-4. Surface Threshold Is Too High



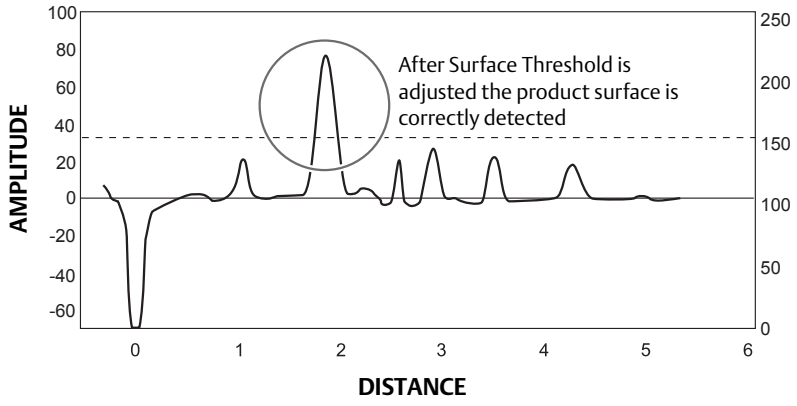
If there are disturbing objects in the tank, the Surface Threshold must be carefully set to avoid locking on the wrong amplitude peak. In Figure 6-5, the Surface Threshold is too low, and as a result the transmitter has locked on a peak above the actual product surface. A disturbance was interpreted as the product surface, since this was the first amplitude peak closest to device that went above Surface Threshold. The actual product surface was interpreted as the interface or the probe end.

Figure 6-5. Surface Threshold Is Too Low



By adjusting the Surface Threshold the product surface is properly detected as illustrated in Figure 6-6:

Figure 6-6. Echo Curve Plot after Surface Threshold Was Adjusted

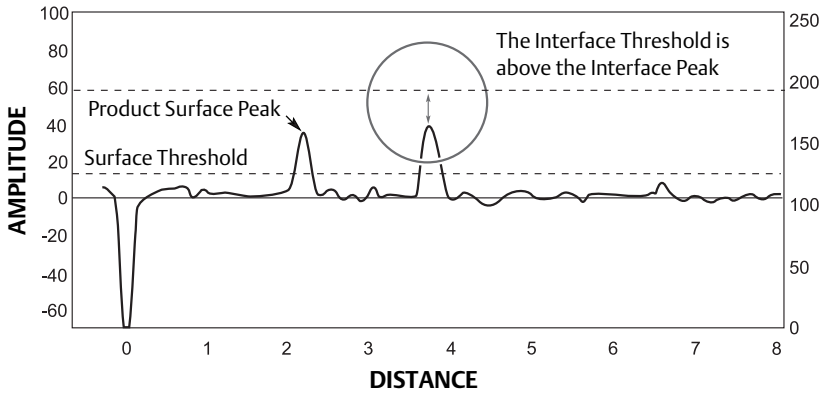


Example 2: Interface Peak not found

In interface applications where the bottom product has a relatively low dielectric constant (<40), or if the signal is attenuated in the upper product, the amplitude of the reflected signal from the interface is relatively low and difficult for the transmitter to detect. In such a case it may be possible to detect the reflected signal from the interface if the Interface Threshold is adjusted.

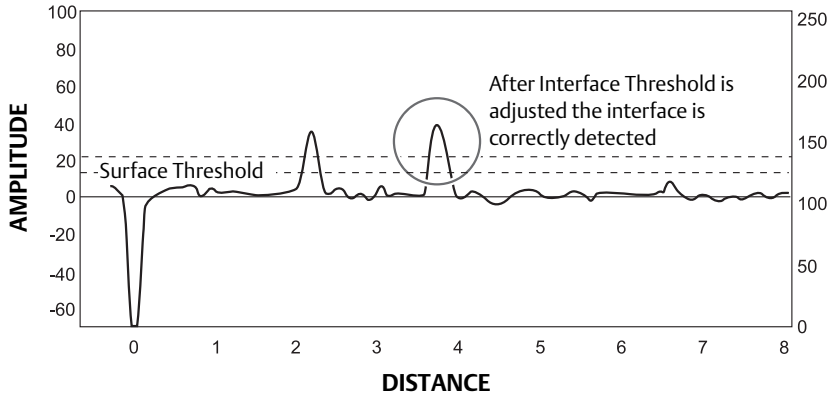
Figure 6-7 illustrates a situation where the Interface Threshold is too high. The signal amplitude peak at the interface between the upper and lower products is not detected in this case.

Figure 6-7. Echo Curve Plot Indicating that the Interface Threshold for the Interface Peak Is Too High



By adjusting Interface Threshold, the peak at the interface between the upper and lower products is detected as illustrated in Figure 6-8.

Figure 6-8. After Changing the Interface Threshold the Transmitter Detects the Interface



6.4.3 Viewing Measurement History

The Measurement History tool presents historical values and related device status that are stored in the transmitter memory. The tool is useful for verifying that the transmitter works properly or to diagnose any issues during a specific time interval.

1. From the *Home* Screen, go to **Service Tools > Maintenance > Routine Maintenance**.
2. Click **Measurement History** and follow the on-screen instructions.

6.4.4 Reviewing Network Join Status and Details

Network Join Status

Wireless devices join the network through a four step process:

Step 1. Network Found

Step 2. Network Security Clearance Granted

Step 3. Network Bandwidth Allocated

Step 4. Network Join Complete

To view the Network Join Status of the device, do the following:

- From the *Home* Screen, go to **Service Tools > Communications > Network Join Status**.

Network Join Details

Obtain detailed information about the network join, and configure how the device attempts to join the network.

- From the *Home* Screen, go to **Service Tools > Communications > Join Details**. Join Details includes:

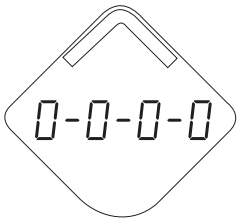
Join Mode	This mode configures how the device attempts to join the network. Settable options are: ■ Don't Attempt to Join ■ Join Now ■ Join on Powerup or Reset
Number of Available Neighbors	Defines how many wireless devices are within the communication range of this device. In a self-organizing network, the more neighbors a device has, the more robust the network will be.
Number of Advertisements Heard	Number of advertised packets received by the device from all networks within range.
Number of Join Attempts	Number of times the device has tried to join the network prior to being accepted. Too many join attempts result in the device considering the join attempt as failed. If this happens, re-check the Join Key and Network ID.

6.4.5 Locating the device

Use the Locate Device function to identify this device by showing a pattern on the device display, as illustrated in Figure 6-9.

1. From the *Home* Screen, go to **Service Tools > Maintenance > Routine Maintenance**.
2. Click **Locate Device** and follow the on-screen instructions.

Figure 6-9. Locate Device Pattern



6.4.6 Using the Simulation Mode

This function can be used to simulate measurements and alerts.

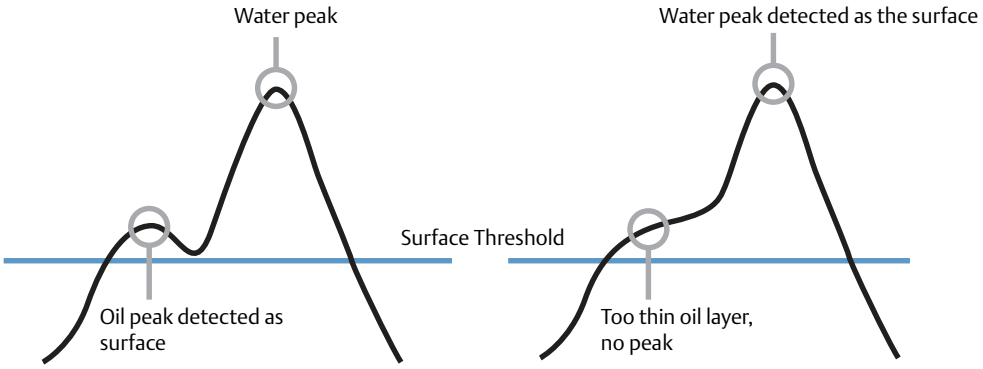
1. From the *Home* Screen, go to **Service Tools > Simulate**.
2. Click desired variable and follow the on-screen instructions.

6.5 Application challenges

6.5.1 Resolving thin oil layers

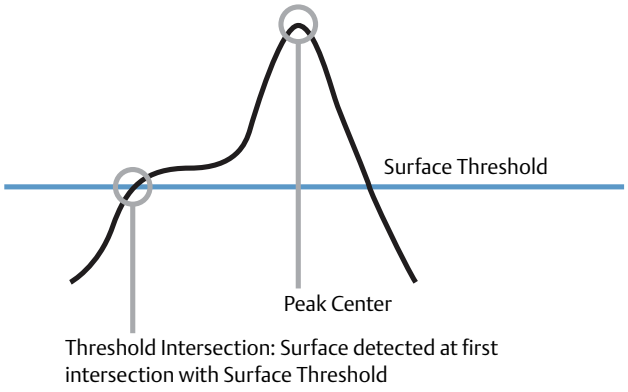
Thin oil layer on top of water might cause jumpy surface readings. Because of the thin oil layer, the transmitter varies between detecting oil and water. Sometimes the oil layer gets too thin to be detected. See Figure 6-10.

Figure 6-10. Thin Oil Layer on Top of Water, Peak Detection Method Set to Peak Center



The surface readings in such applications will be stabilized by setting the Peak Detection Method to Threshold Intersection. The point used for level measurement is then changed, see Figure 6-11. Note that this configuration should only be performed by advanced users as it could cause issues if configured incorrectly.

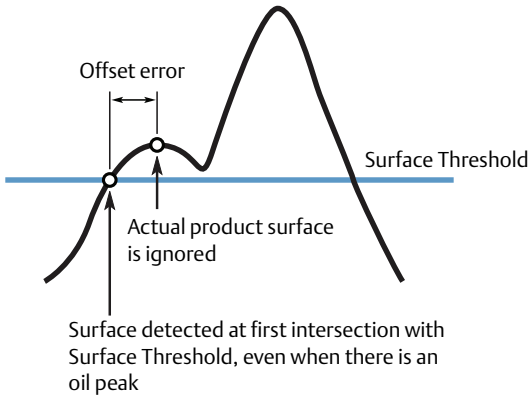
Figure 6-11. The Different Peak Detection Methods



To set the Peak Detection Method to Threshold Intersection, do the following:

1. From the *Home* Screen, go to **Service Tools > Echo Tuning > Advanced**.
2. Under **Peak Detection Method**, select **Threshold Intersection** and then click **Send**.
3. Run Verify Level to compensate for any offset error (see Figure 6-12) introduced by the Threshold Intersection method. See "Verify Level" on page 59 for further instructions.

Figure 6-12. Thin Oil Layer on Top of Water, Peak Detection Method Set to Threshold Intersection



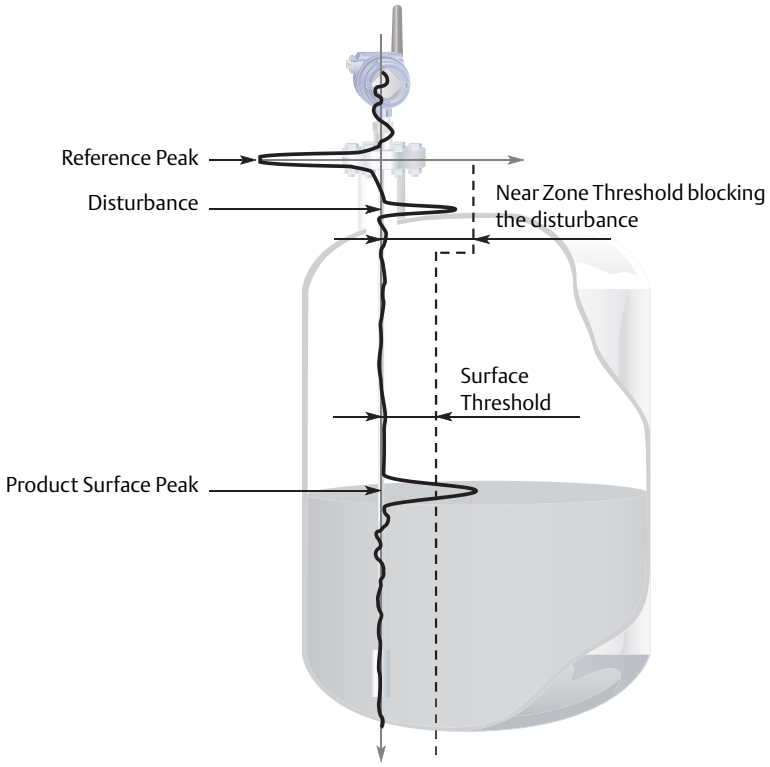
6.5.2 Handling disturbances at the top of the tank

Adjusting the Near Zone Threshold

The Near Zone Threshold is used to filter out disturbing echoes and noises at the top of the tank. By default, this threshold is automatically calculated by the device, and is sufficient in most conditions.

However, in the case of unfavorable conditions, you might need to manually set the Near Zone Threshold. This may for example be the case if a Single Lead probe is mounted in a narrow nozzle, if the end of the nozzle protrudes into the tank, or if there are disturbing obstacles in the Near Zone (referred to as the region between 0-3.3 ft (0-1 m) below the Upper Reference Point.

Figure 6-13. Near Zone Threshold



Guidelines for setting the Near Zone Threshold

- The Near Zone Threshold must be higher than the Surface Threshold to have an effect. The threshold in the near zone is set to the highest value of the configured Near Zone Threshold and Surface Threshold.
- The margin to waveform disturbances and noise must be at least 3 Cnts.

Procedure

To manually set the Near Zone Threshold function, do the following:

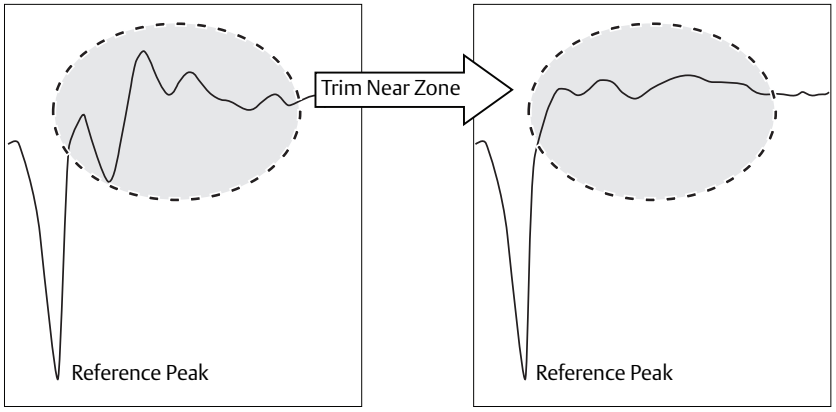
1. Read the Echo Curve:
   a. Start the Echo Curve reading, refer to "Reading the Echo Curve" on page 83.
   b. View the Echo Curve plot to find out if there are disturbing echoes close to the tank top.
2. Set the Near Zone Threshold:
   a. From the *Home* Screen, go to **Service Tools > Echo Tuning > Near Zone > Near Zone Threshold**.
   b. Under **Threshold Control**, select **User Defined**.
   c. If using Field Communicator, click **Send**. The Threshold and End Distance values can now be changed.
   d. Under **Threshold**, type the desired value into the box.
   e. Under **End Distance**, type the desired value into the box. This value is the distance from Upper Reference Point to point where the Near Zone Threshold ends.

Using the Trim Near Zone function

The Trim Near Zone function is used to fine tune performance in the area close to the tank top. Normally it is not necessary to use the function, but if you experience problems related to the nozzle, pipe, or chamber installation, you may need to use this function.

Figure 6-14 describes the Trim Near Zone function and its effect on the echo curve. This effect is only visible if measurement conditions so require.

Figure 6-14. Echo Curve before and after Trim Near Zone



Note
Make sure the product level is below the Near Zone region (0-3.3 ft. (0-1 m) below the Upper Reference Point) before performing the Trim Near Zone.

Note
The Trim Near Zone function should only be used for reducing impact from stationary disturbances. For occasional disturbances, use the Near Zone Threshold.

To use the Trim Near Zone function, do the following:

1. From the *Home* Screen, go to **Service Tools > Echo Tuning** and click **Near Zone**.
2. Under **Near Zone Compensation**, click **Trim Near Zone** and follow the on-screen instructions.

Changing the Upper Null Zone

Measurements are not performed within the Upper Null Zone (UNZ). The Upper Null Zone can be extended to block out disturbing echoes close to the tank top, caused by for example a narrow nozzle with rough walls, obstacles close to the probe, or a nozzle that protrudes into the tank. See Figure 6-16.

Note
Desired measuring range must be below the Upper Null Zone.

Note
Before changing the Upper Null Zone, check entered limit and deadband values for the High Level Alerts. High Level Alerts should not be placed in the Upper Null Zone.

To set the Upper Null Zone do the following:

1. Identify desired Upper Null Zone using the Echo Curve plot:
   a. Start the Echo Curve reading, refer to "Reading the Echo Curve" on page 83.
   b. View the Echo Curve plot to find out if there are disturbing echoes close to the tank top.
2. Set the desired Upper Null Zone value:
   a. From the *Home* Screen, go to **Configure > Manual Setup > Level Setup > Probe > Advanced Probe Options**.
   b. Under **Upper Null Zone**, type the desired value into the box and then click **Send**.

Figure 6-15. Upper Null Zone

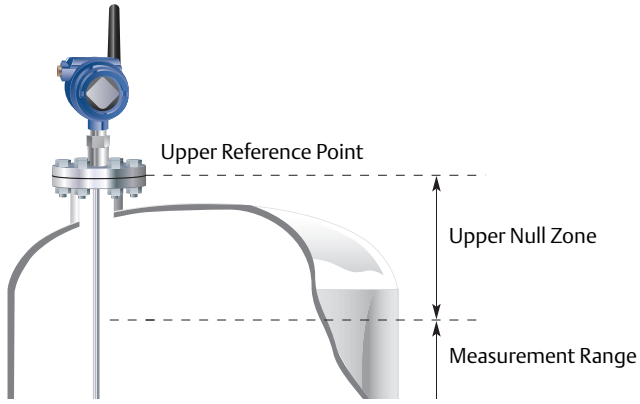
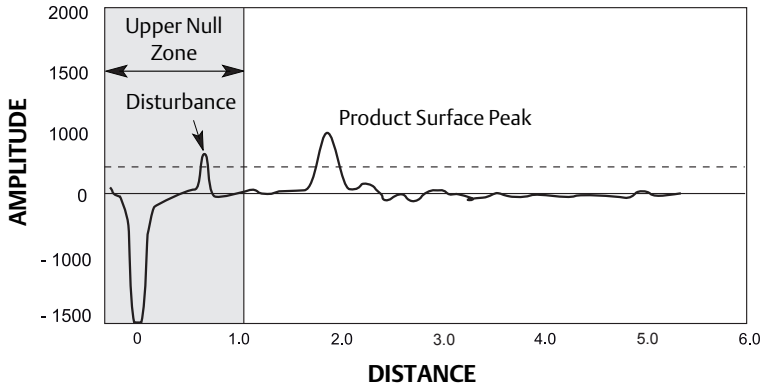


Figure 6-16. Upper Null Zone Is Extended to Block Out Disturbances at the Top of the Tank



6.5.3 Interface measurements with fully submerged probes

The Measurement Mode Interface Level with Submerged Probe is used to handle interface measurements when the product level is not visible, for example in a full chamber pipe as illustrated in Figure 6-17. In this case the probe is fully submerged into the upper product, and only the interface level is detected by the transmitter.

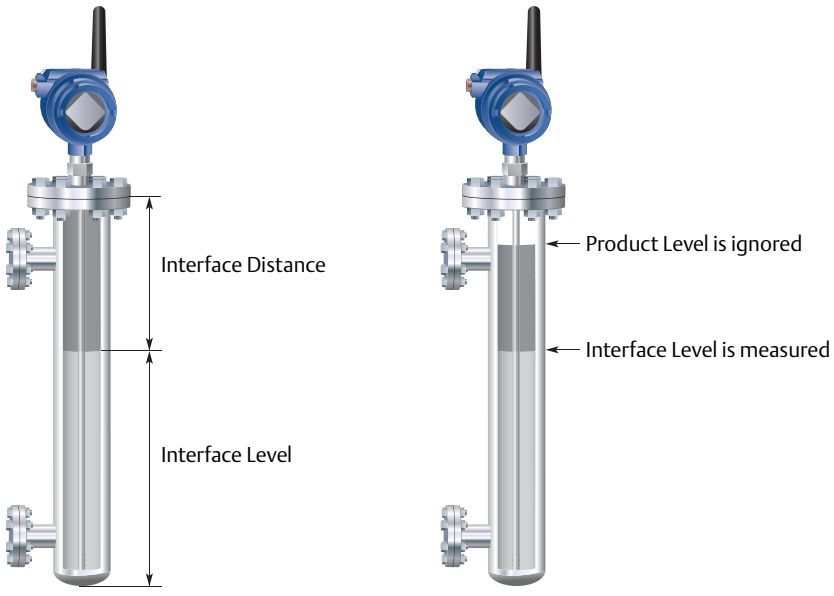
Even if the upper product level drops, it is ignored by the transmitter which continues to measure only the interface level. If the product level drops, the air filled region in the upper part of the pipe will slightly reduce the measurement accuracy of the interface level. To achieve high accuracy in this Measurement Mode the probe must be fully submerged.

To set the Measurement Mode to Interface Level with Submerged Probe, do the following:

1. From the *Home* Screen, go to **Configure > Manual Setup > Level Setup > Environment**.
2. Under **Measurement Mode**, select **Interface Level with Submerged Probe** (**Interface Only** in Field Communicator) and then click **Send**.

Note
Do not set Measurement Mode to Interface Level with Submerged Probe in “standard” applications when both Product Level and Interface Level are measured.

Figure 6-17. Interface Level Measurements in a Full Chamber



Note
Adjust Interface Threshold if the interface level pulse is not detected.

6.5.4 Noise or weak surface echoes

In order to increase the measurement performance in difficult applications where the surface echo peak is low compared to the noise, it is recommended to set the Performance Mode to High (Short battery life). A low surface peak compared to the noise might be caused by a turbulent surface, low dielectric constant, plastic tanks and so on.

If the Performance Mode is set to High (Short battery life), each update is based on an increased number of measurements (radar sweeps), which gives improved robustness and decreases the noise in the output value. However, the battery life is significantly reduced (between 40-60%).

To set the Performance Mode to High (Short battery life), do the following:

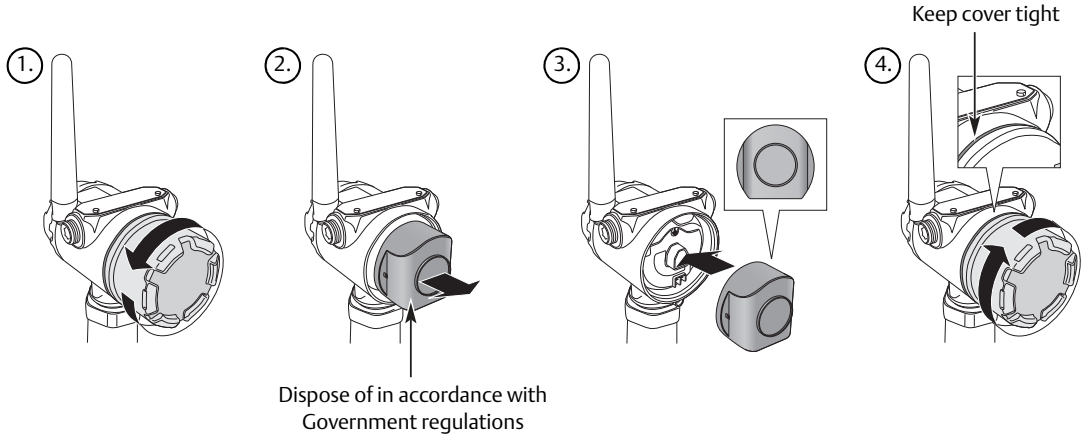
1. From the *Home* Screen, go to **Service Tools > Echo Tuning > Advanced**.
2. Under **Performance Mode**, select **High (Short battery life)** and then click **Send**.

6.6 Power module replacement

Replace the power module with a new Black Power Module, SmartPower™ Solutions model number 701PBKKF.

Expected power module life is 9 years at reference conditions(1).

1. Replace the power module.



2. In AMS Wireless Configurator or Field Communicator, run Install New Power Module setup.
   a. From the *Home* Screen, go to **Service Tools > Maintenance > Routine Maintenance**.
   b. Click **Install New Power Module** and follow the on-screen instructions.

(1) *Reference conditions are 70° F (21° C), transmit rate of once per minute, and routing data for three additional network devices.*

Handling considerations

The Black Power Module with the wireless unit contains two "C" size primary lithium/thionyl chloride batteries. Each battery contains approximately 2.5 grams of lithium, for a total of 5 grams in each Power Module. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the battery pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Contacts should be protected to prevent premature discharge.

Use caution when handling the power module, it may be damaged if dropped from heights in excess of 20 ft (6 m).

⚠ Battery hazards remain when cells are discharged.

Environmental considerations

As with any battery, local environmental rules and regulations should be consulted for proper management of spent batteries. If no specific requirements exist, recycling through a qualified recycler is encouraged. Consult the materials safety data sheet for battery specific information.

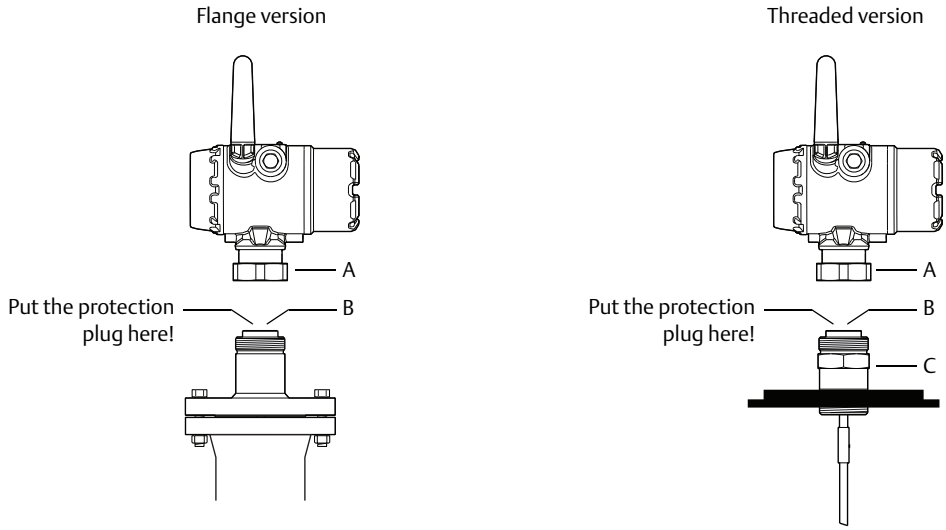
Shipping considerations

The unit was shipped to you without the power module installed. Please remove the power module prior to shipping.

Each Black Power Module contains two "C" size primary lithium batteries. Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by International Air Transport Association (IATA), International Civil Aviation Organization (ICAO), and European Ground Transportation of Dangerous Goods (ARD). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Please consult current regulations and requirements before shipping.

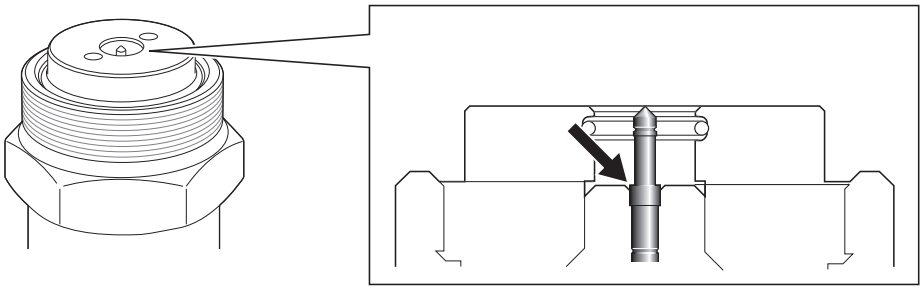
6.7 Transmitter head replacement

Figure 6-18. Transmitter Head Replacement



A. Nut
B. Process Seal
C. Adapter

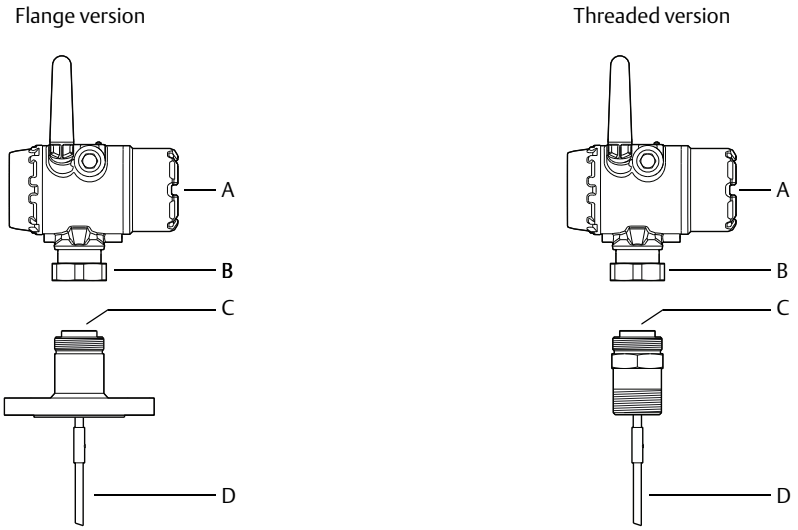
1. Loosen the nut that connects the transmitter head to the process seal.
2. Carefully lift the transmitter head.
3. On the probe, make sure that the upper surface of the process seal is clean and free from dust and water. Wipe it clean with a dry and lint-free cloth.
4. Verify the spring-loaded pin at the center of the process seal is properly inserted. When inserted properly only the plunger is seen above the edge inside the seal hole.



5. If the transmitter head is not mounted directly, attach the protection plug to the process seal to protect the exposed parts from dust and water. If a protection plug is not available, then cover the process seal with a plastic bag.
6. Rotate the new transmitter head so the device display faces the desired direction.
7. Tighten the nut. Max torque is 30 Lbft (40 Nm).
8. Configure the transmitter, refer to Section 4: Configuration.

6.8 Probe replacement

Figure 6-19. Probe Replacement



A. Transmitter head
B. Nut
C. Process Seal
D. Probe

1. Loosen the nut.
2. Remove the transmitter head from the old probe. Make sure to protect the transmitter head bottom from dust and water.
3. On the new probe, make sure that the protection plug is removed and the upper surface of the Process Seal is clean. Also make sure that the spring-loaded pin at the center of the Process Seal is properly inserted.
4. Mount the transmitter head on the new probe.
5. Tighten the nut. Max torque is 30 Lbft (40 Nm).
6. If the new probe is not of the same type as the old one, update the transmitter configuration by setting the Probe Type parameter to the appropriate value:
   a. From the *Home* Screen, go to **Configure > Manual Setup > Level Setup > Probe**.
   b. Under **Probe Type**, select desired Probe Type.
7. Measure the Probe Length and enter the measured value:
   a. From the *Home* Screen, go to **Configure > Manual Setup > Level Setup > Probe**.
   b. Under **Probe Length**, enter the measured Probe Length value.
8. Run Verify Level to check your level measurement, refer to "Verify Level" on page 59.

Appendix A Reference Data

A.1 Functional specifications

A.1.1 General

Field of application

Liquids and semi-liquids level or liquid/liquid interfaces

- 3308Axx1... for level or submerged probe interface measurement
- 3308Axx2... for level and interface measurement

Measurement principle

Time Domain Reflectometry (TDR)

(See "Theory of operation" on page 3 for a description of how it works)

Microwave output power

Nominal 10 µw, Max <20 mW

Humidity limits

0 to 100% relative humidity

A.1.2 Wireless

Output

IEC 62591 (*Wireless*HART®) 2.4 GHz DSSS

Frequency range

2400 - 2483.5 MHz

Radio frequency output from antenna

- External (WK option) antenna: Maximum10 mW (+10dBm) EIRP
- High Gain, Remote (WN option) antenna: Maximum of 40mW (16dBm) EIRP

Modulation type

QPSK/iEEE 802.15.4 DSSS IEC 62591 (*Wireless*HART)

Number of channels

15

Channel spacing

5 MHz

Emission designation

G1D

Transmit rate

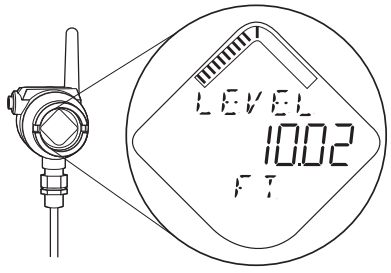
User selectable, 4 seconds to 60 minutes

A.1.3 Display and configuration

Device display

The optional device display can show sensor variables and diagnostic information. Display updates at each wireless update.

Figure A-1. Device Display



Output units

- For Level, Interface, and Distance: ft, inch, m, cm, or mm
- For Volume: ft^3, $inch^3$, US gals, Imp gals, barrels, yd^3, m^3, or liters
- For temperature: °F, °C

Output variables

	Display	PV, SV, TV, QV
Level	X	X
Distance	X	X
Surface Signal Strength	N/A	X(2)
Total Volume	X	X
Interface Level(1)	X	X
Interface Distance(1)	X	X
Interface Signal Strength(1)	N/A	X(2)
Upper Product Thickness(3)	X	X
Electronics Temperature	X	X(2)
Signal Quality	X	X(2)
Supply Voltage	X	X(2)
% of Range	X	X(2)

(1) For 3308Axx1, Interface measurement is only available for fully submerged probe.
(2) Not available as primary variable.
(3) Only available with 3308Axx2.

HART diagnostics

Signal Quality Metrics - Diagnostics package that monitors the relations between surface, noise and threshold. The function can be used to detect abnormal conditions in the process such as probe coating or sudden loss of signal strength. Signal Quality is available as Output Variable and it comes with user configurable alerts through AMS Wireless Configurator or Field Communicator.

A.1.4 Temperature limits

Ambient and storage temperature limits

Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

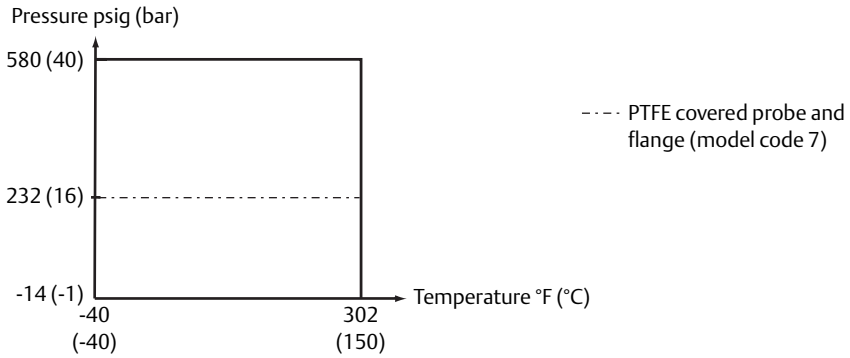
	Operating limit	Storage limit
With Device Display	-40 to 175 °F (-40 to 80° C)(1)	-40 to 185 °F (-40 to 85 °C)
Without Device Display	-40 to 185 °F (-40 to 85° C)	-40 to 185 °F (-40 to 85 °C)

(1) Device display may not be readable and device display updates will be slower at temperatures below -4 °F (-20 °C).

A.1.5 Process temperature and pressure rating

Process temperature

Figure A-2. Max. Rating, Standard Tank Connections



Note
The maximum process temperature is at the lower part of the flange.

Final rating depends on flange and O-ring selection. Table A-1 gives the temperature ranges for standard tank seals with different O-ring materials.

Table A-1. Temperature Ranges for Standard Tank Seals with Different O-ring Materials

Tank seal with different O-ring material	Min. temperature °F (°C) in air	Max. temperature °F (°C) in air
Viton® Fluoroelastomer	5 (-15)	302 (150)
Ethylene Propylene (EPDM)	-40 (-40)	266 (130)
Kalrez® 6375 Perfluoroelastomer	14 (-10)	302 (150)
Nitrile Butadiene (NBR)	-31 (-35)	230 (110)

Note
Always check the chemical compatibility of the o-ring material with your application. If the o-ring material is not compatible with its chemical environment, the o-ring may eventually malfunction.

ASME/ANSI flange rating

316L SST Flanges according to ASME B16.5 Table 2-2.3:

- Max. 302 °F/580 psig (150 °C/40 bar)

EN flange rating

EN 1.4404 according to EN 1092-1 material group 13E0:

- Max. 302 °F/580 psig (150 °C/40 bar)

Fisher® & Masoneilan® flange rating

316L SST Flanges according to ASME B16.5 Table 2-2.3:

- Max. 302 °F/580 psig (150 °C/40 bar)

JIS flange rating

316L SST Flanges according to JIS B2220 material group 2.3:

- Max. 302 °F/580 psig (150 °C/40 bar)

Tri-Clamp™ rating

Maximum pressure is 16 bar for 1½-in. (37.5 mm) and 2-in. (50 mm) housing; and 10 bar for 3-in. (75 mm) and 4-in. (100 mm) housing. The final rating depends on the clamp and gasket.

Plate design

The PTFE covered probe with plate design has a protective plate in PTFE and a backing flange in 316L / EN 1.4404. The protective flange plate prevents the backing flange from being exposed to the tank atmosphere.

Flange rating according to SST backing flange ASME B16.5 Table 2-2.3, EN 1092-1 material group 13E0, and JIS B2220 material group 2.3.

PTFE protective plate:

- Max. 302 °F/232 psig (150 °C/16 Bar)

Flange connection rating

See Table A-2 for the conditions used for flange strength calculations.

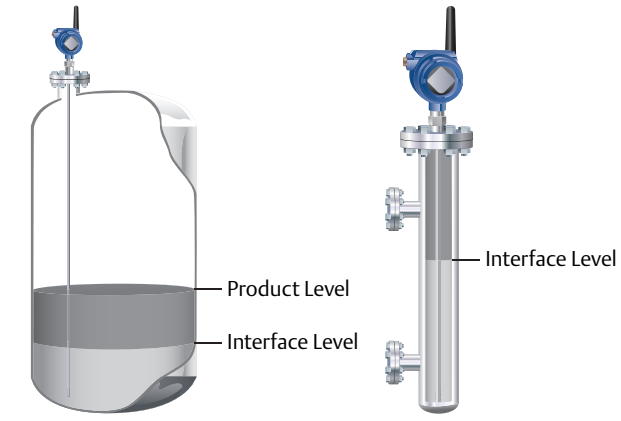
Table A-2. Conditions Used for Flange Strength Calculations

	Bolting material	Gasket	Flange material	Hub material
ASME/ANSI	SST SA193 B8M Class 2	Soft (1a) with min. thickness 1.6 mm	SST A182 Gr. F316L and EN 10222-5-1.4404	SST SA479M 316L and EN 10272-1.4404
EN, JIS	EN 1515-1/-2 group 13E0, A4-70	Soft (EN 1514-1) with min. thickness 1.6 mm		

A.1.6 Interface measurements

The Rosemount 3308 Series is well suited for interface measurements, including applications where the probe is fully submerged in the liquid.

Figure A-3. Interface Level Measurement



If interface is to be measured, follow these criteria:

- The dielectric constant of the upper product must be known and should not vary. The AMS Wireless Configurator and Field Communicator have a built-in Dielectric Constant Guide to assist users in determining the dielectric constant of the upper product.
- The dielectric constant of the upper product must have a lower dielectric constant than the lower product to have a distinct reflection.
- The difference between the dielectric constants for the two products must be larger than 10.
- Maximum dielectric constant for the upper product is 10 for the coaxial probe, and 5 for the single lead and flexible twin lead probes.
- Minimum detectable upper product thickness is 4.9 in. (12.5 cm) when the upper product is oil (DC=2.2) and the lower product is water (DC=80).

For guidelines on emulsion situations, consult your local Emerson Process Management representative.

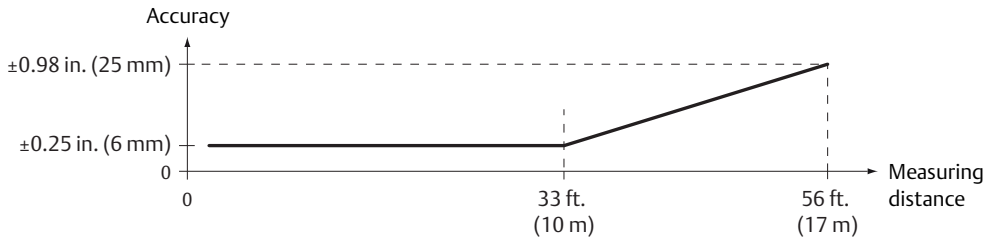
A.2 Performance specifications

A.2.1 General

Reference conditions[1]

Single flexible probe mounted in a 4" pipe. Normal indoor temperature (68° - 79 °F, 20° - 26 °C) water.

Reference accuracy



Repeatability

±0.08 in. (2 mm)[2]

Ambient temperature effect

Less than 0.01% of measured distance per °C

Power module battery life

9 years at one minute update rate[3]

A.2.2 Environment

Vibration resistance

No effect when tested per the requirements of IEC60770-1 (1999): High Vibration Level - field or pipeline (10-60 Hz 0.21 mm displacement peak amplitude / 60-2000 Hz 3g).

Electromagnetic compatibility

- Meets CE 61326:2012 and NE21:2012 if installed in metallic vessels or still pipes.
- Single lead probes are not suited for non-metallic tanks or open atmosphere applications, due to high susceptibility to strong electromagnetic fields.

(1) *Please refer to the IEC 60770-1 (IEC 1292-2) standard for a definition of radar specific performance parameters and if applicable corresponding test procedure.*
(2) *According to IEC61298-2 (at reference conditions where averaging at specified measuring points was used to be able to capture specific parameters e.g. hysteresis, non-repeatability etc.). For field verification where reference conditions cannot be established the repeatability may be verified if the transmitter is operating in High Performance Mode.*
(3) *Reference conditions are 70 °F (21 °C), and routing data for three additional network devices.*

A.2.3 Accuracy over measuring range

The measuring range depends on probe type, dielectric constant of the product and installation environment, and is limited by the Blind Zones at the very top and bottom of the probe. In the Blind Zones, the accuracy exceeds ±1.18 in. (30 mm), and measurements may not be possible. Measurements close to the Blind Zones will have reduced accuracy.

The following conditions will impact the Blind Zones:

- If the single lead probes or flexible twin lead probes are installed in a nozzle, the nozzle height shall be added to the specified Upper Blind Zone.
- The measuring range for the PTFE covered Flexible Single Lead probe includes the weight when measuring on a high dielectric media.
- When using a metallic centering disc, the Lower Blind Zone is 8 in. (20 cm), including weight if applicable. When using a PTFE centering disc, the Lower Blind Zone is not affected.

Figure A-4, Figure A-5, and Figure A-6 illustrate the accuracy over measuring range at reference condition using the Trim Near Zone function, with alternating probe types and varying dielectric constant of the product.

Figure A-4. Accuracy over Measuring Range for Single Lead Probes

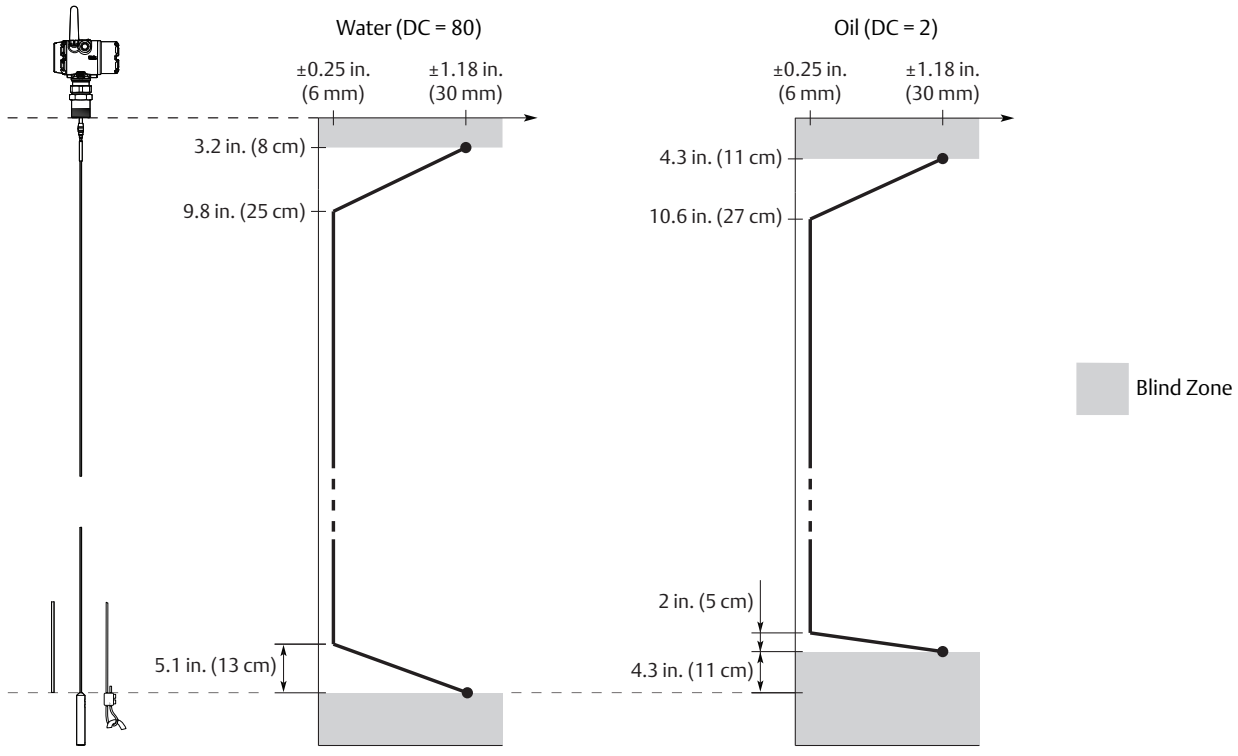


Figure A-5. Accuracy over Measuring Range for Flexible Twin Lead Probe

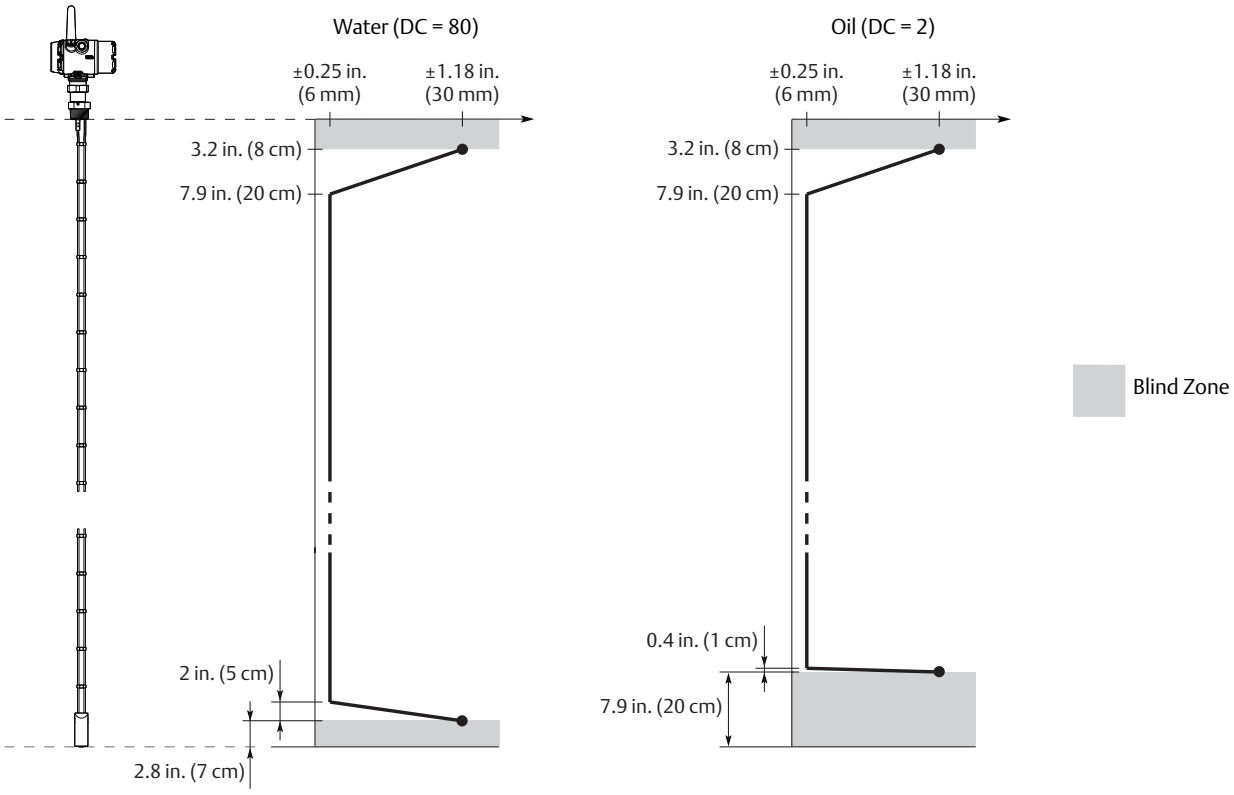
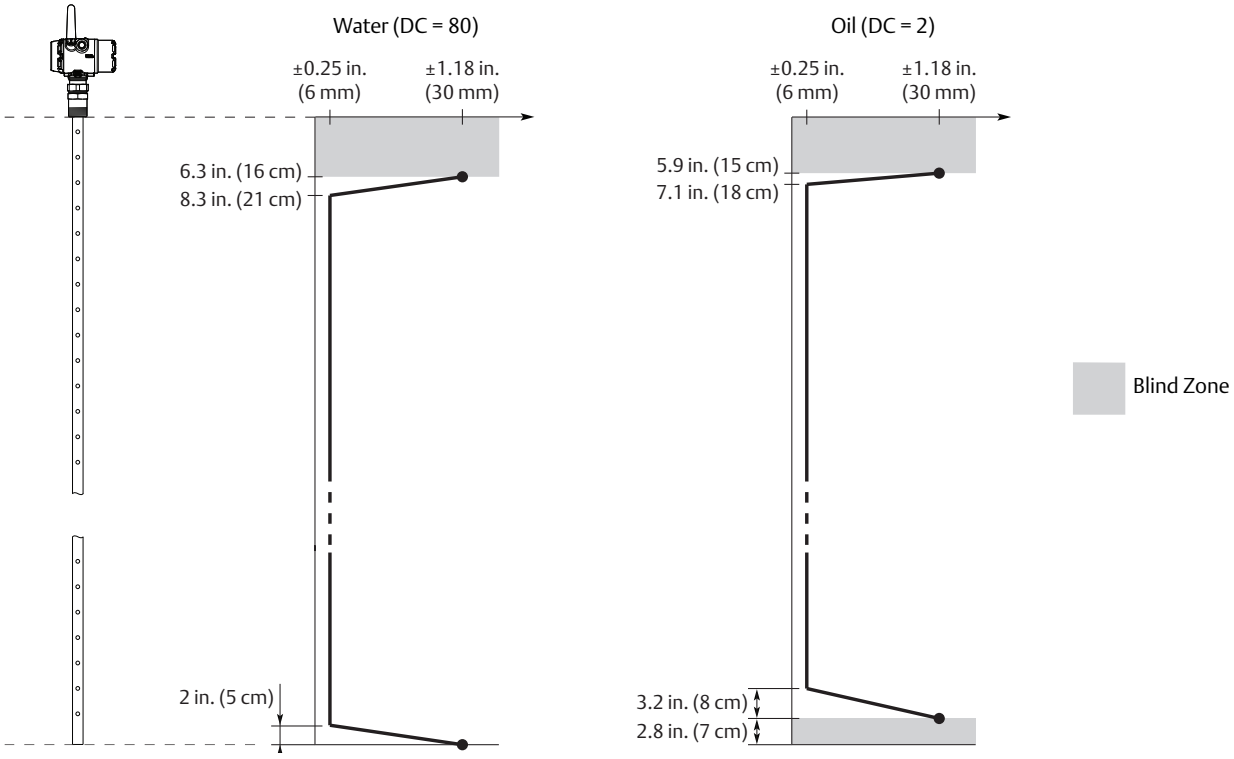


Figure A-6. Accuracy over Measuring Range for Coaxial Probe



A.2.4 Maximum measuring range and minimum dielectric constant

Table A-3. Measuring Range and Minimum Dielectric Constant

	Flexible single lead	Rigid single lead	Flexible twin lead	Coaxial
Maximum measuring range	55.8 ft (17 m)	9.8 ft (3 m) for 8 mm probes (code 4A) 19.7 ft (6 m) for 13 mm probes (code 4B)	55.8 ft (17 m)	19.7 ft (6 m)
Minimum dielectric constant(1)(2)	2.0 up to 32.8 ft (10 m) 10 up to 55.8 ft (17 m)	2.0	2.0 up to 32.8 ft (10 m) 10 up to 55.8 ft (17 m)	2.0

(1) Minimum dielectric constant may be lower than 2.0 if one or more of the following conditions apply:
- Probe is installed in stilling well or chamber.
- Maximum measuring range is not utilized.
- Noise Threshold is manually adjusted to a lower level.
(2) For temperatures above 140 °F (60 °C) manual adjustment of noise threshold may be required for products with low dielectric constant at or close to maximum measuring range.

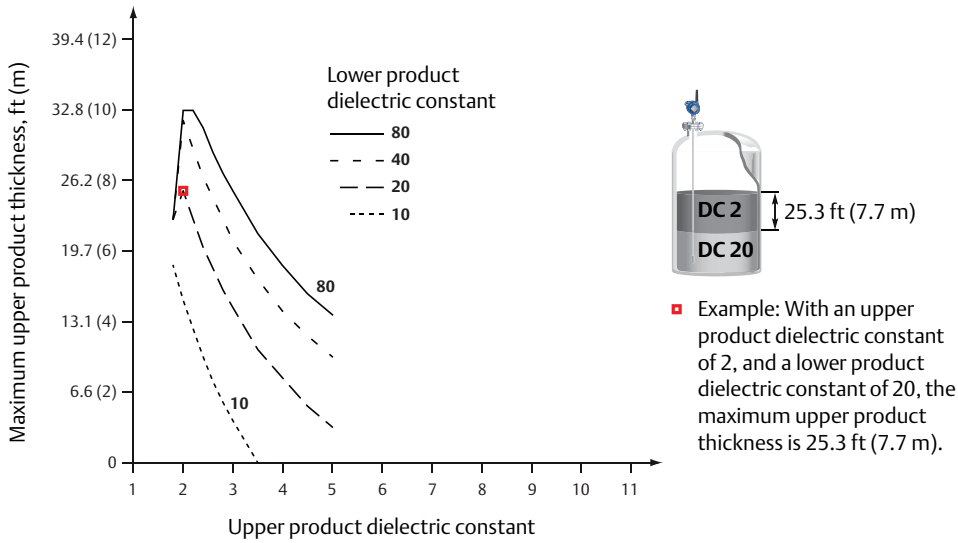
A.2.5 Interface measuring range

The maximum allowable upper product thickness/measuring range is primarily determined by the dielectric constants of the two liquids.

Target applications include interfaces between oil/oil-like and water/water-like liquids, with a low (<3) dielectric constant for the upper product and a high (>20) dielectric constant for the lower product. For such applications, the maximum measuring range is limited by the length of the coaxial and rigid single lead probes.

For flexible probes, the maximum measuring range is reduced by the maximum upper product thickness, according to the diagram below. However, characteristics may vary between the different applications.

Figure A-7. Maximum Upper Product Thickness for Flexible Probes



A.2.6 Viscosity and Coating/Build-up

Table A-4. Maximum Recommended Viscosity and Coating/Build-up

	Single lead	Flexible twin lead	Coaxial
Maximum viscosity	8000 cP(1)	1500 cP	500 cP
Coating / build-up	Coating allowed	Thin coating allowed, but no bridging	Coating not recommended

(1) Consult your local Emerson Process Management representative in the case of agitation/turbulence and high viscous products.

A.3 Physical specifications

A.3.1 Material selection

Emerson provides a variety of Rosemount product with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The Rosemount product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options and components for the particular application. Emerson Process Management is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

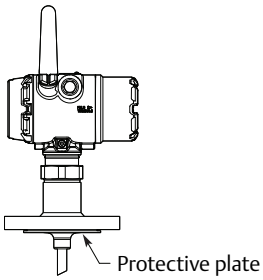
A.3.2 Tank connection and probe

Tank connection

The tank connection consists of a tank seal, a flange, Tri-Clamp, or NPT or BSP/G threads.

The PTFE covered probe with plate design has a protective plate in PTFE and a backing flange in 316L / EN 1.4404. The protective flange plate prevents the backing flange from being exposed to the tank atmosphere.

Figure A-8. PTFE Covered Probe and Protective Plate



See "Dimensional drawings" on page 131.

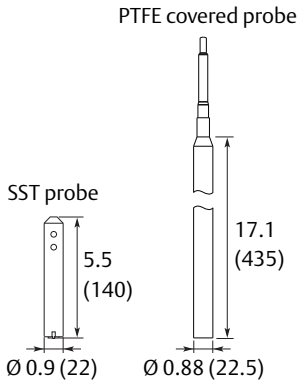
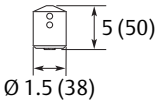
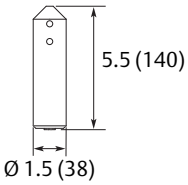
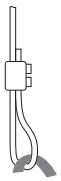
Flange dimensions

Follows ASME B16.5, JIS B2220, and EN 1092-1 standards for blind flanges. For Proprietary Fisher and Masoneilan flanges, see "Proprietary Flanges" on page 137.

Probe versions

Flexible Single Lead, Rigid Single Lead, Flexible Twin Lead, and Coaxial. There are in total four weight and anchoring options for Flexible Single Lead probes.

Table A-5. Weight and Anchoring Options for Flexible Single Lead Probes

Weight and anchoring option	Weight lb (kg)	Dimension in. (mm)	Application
W1 (Small weight)	SST probe: 0.88 (0.40) PTFE covered probe: 2.20 (1)		A small weight is recommended for narrow tank openings less than 1.5 inches (38 mm). Required weight option for PTFE covered probes.
W2 (Short weight)	0.88 (0.40)		A short weight is available for the single flexible stainless steel probe. It is recommended for maximized measuring ranges with measurements close to the probe end.
W3 (Heavy weight)	2.43 (1.10)		A heavy weight is the recommended choice for most applications.
W4 (Chuck)	-		To tie probe end to tank bottom.

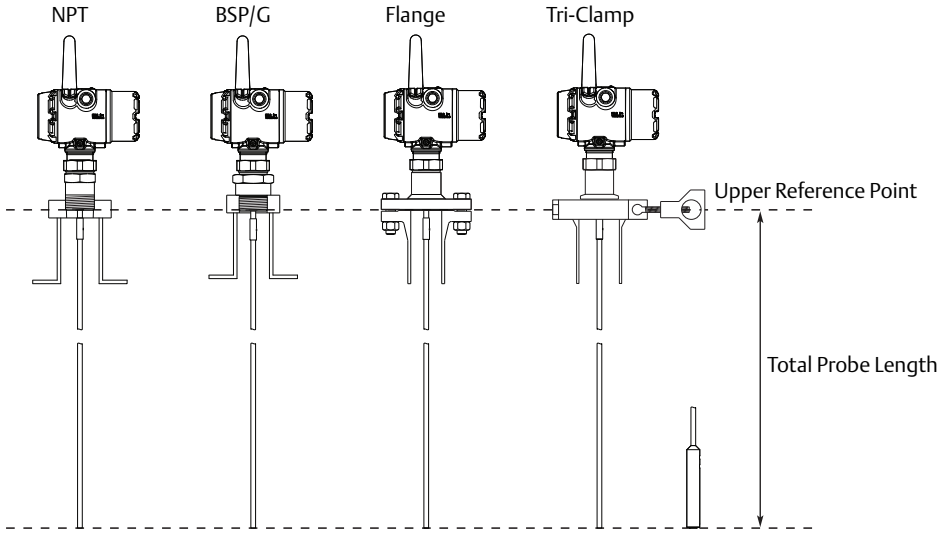
Material exposed to tank atmosphere

- Material of construction code 1: 316L stainless steel (EN 1.4404), PTFE, PFA, and O-ring materials
- Material of construction code 7: PTFE (1 mm PTFE cover)
- Material of construction code 8: PTFE, 316 L SST (EN 1.4404), and O-ring materials

Total probe length

This is defined from the Upper Reference Point to the end of the probe (weight included, if applicable).

Figure A-9. Total Probe Length



Select the probe length according to the required measuring range (the probe must be hung and fully extended through the entire distance where level readings are desired).

Cut-to-fit probes

All probes can be cut in field except for the PTFE covered probe. However, there are some restrictions for the coaxial probe: Probes over 4.1 ft (1.25 m) can be cut up to 2 ft (0.6 m). Shorter probes can be cut to the minimum length of 1.3 ft (0.4 m).

Minimum and maximum probe length

- Flexible Single Lead: 3.3 ft (1 m) to 55.8 ft (17 m)
- Rigid Single Lead (0.3 in./8 mm): 1.3 ft (0.4 m) to 9.8 ft (3 m)
- Rigid Single Lead (0.5 in./13 mm): 1.3 ft (0.4 m) to 19.7 ft (6 m)
- Flexible Twin Lead: 3.3 ft (1 m) to 55.8 ft (17 m)
- Coaxial: 1.3 ft (0.4 m) to 19.7 ft (6 m)

Probe angle

0 to 90 degrees from vertical axis

Tensile strength

- Flexible Single Lead: 2698 lb (12 kN)
- Flexible Twin Lead: 2023 lb (9 kN)

Collapse load

Flexible Single Lead: 3597 lb (16 kN)

Sideway capacity

- Rigid Single Lead: 4.4 ft. lbf, 0.44 lb at 9.8 ft. (6 Nm, 0.2 kg at 3 m)
- Coaxial: 73.7 ft. lbf, 3.7 lb at 19.7 ft. (100 Nm, 1.67 kg at 6 m)

Minimum pipe/bypass diameter

- Flexible Single Lead: Consult your local Emerson Process Management representative.
- Rigid Single Lead: 2 in. (50 mm)
- Flexible Twin Lead: Consult your local Emerson Process Management representative.
- Coaxial: 1.5 in. (38 mm)

Weight

Type		Weight
Flange		Depends on flange size
Flexible Single Lead probe		0.05 lb/ft. (0.07 kg/m)
Rigid Single Lead probe (0.3 in./8 mm)		0.27 lb/ft. (0.4 kg/m)
Rigid Single Lead probe (0.5 in./13 mm)		0.71 lb/ft. (1.06 kg/m)
Flexible Twin Lead probe		0.09 lb/ft. (0.14 kg/m)
Coaxial probe		0.67 lb/ft. (1 kg/m)
End weight	W1	SST probe: 0.88 lb (0.40 kg) PTFE covered probe: 2.20 lb (1 kg)
	W2	0.88 lb (0.40 kg)
	W3	2.43 lb (1.10 kg)

Other mechanical considerations

To get best possible performance, the following must be considered before installing the transmitter:

- Inlets should be kept at a distance in order to avoid product filling on the probe.
- Avoid physical contact between probes and agitators, as well as applications with strong fluid movement unless the probe is anchored.
- Probe tie-down is recommended if the probe can move to within 1 ft. (30 cm) of any object during operations.
- In order to stabilize the probe for side forces, it is possible to fix or guide the probe to the tank bottom.
- Single lead probes are not suited for non-metallic tanks or open atmosphere applications, due to high susceptibility to strong electromagnetic fields.

A.3.3 Engineered solutions

When standard model codes are not sufficient to fulfill requirements, please consult the factory to explore possible Engineered Solutions. This is typically, but not exclusively, related to the choice of wetted materials or the design of a process connection. These Engineered Solutions are part of the expanded offerings and may be subject to additional delivery lead time. For ordering, factory will supply a special P-labeled numeric option code that should be added at the end of the standard model string. See example model string below.

Example Model String:
3308A-S-X-2-D1-I5-S-1-V-2-NN-N-5A-E-030-00-WA3-WK1-M5-W3-**P1234**

A.3.4 Chamber/pipe installations

General chamber considerations

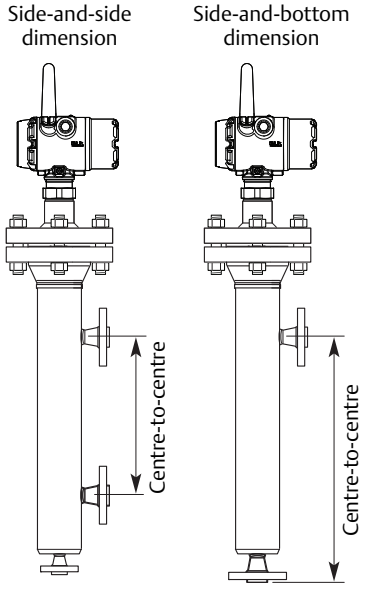
The recommended minimum chamber diameter is 4 in. (100 mm) for Single Flexible probe and 3 in. (75 mm) for the Single Rigid probe. The probe should be centered to prevent it touching the sides of the well.

PTFE covered probes are not recommended for chamber/pipe installations.

Rosemount 9901 Chamber

Rosemount 9901 allows external mounting of process level instrumentation. It supports a variety of process connections, and optional drain and vent connections. The Rosemount 9901 chamber is designed to the ASME B31.3 standard, and is Pressure Equipment Directive (PED) compliant. Use option code XC to order together with the 3308 Series Transmitter.

Figure A-10. Side-and-Side and Side-and-Bottom Chambers



The probe length to use for a Rosemount 9901 chamber can be calculated with this formula:

Side-and-side dimension:
Probe length=Centre-to-centre dimension + 19 in. (48 cm)

Side-and-bottom dimension:
Probe length=Centre-to-centre dimension + 4 in. (10 cm)

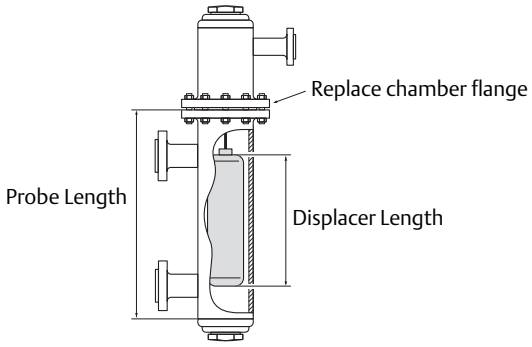
Use a centering disc the same diameter as the chamber if the probe length >3.3 ft. (1 m). See "Centering discs" on page 118 for which disc to use.

For additional information, see the Rosemount 9901 Chamber for Process Level Instrumentation Product Data Sheet (document number 00813-0100-4601).

Existing chamber

A Rosemount 3308 Series Transmitter is the perfect replacement in an existing displacer chamber. Proprietary flanges are offered, enabling use of existing chambers to make installation easy.

Figure A-11. Existing Displacer Chamber



Considerations when changing to 3308 Series:

- The 3308 Series flange choice and probe length must be correctly matched to the chamber. Both standard ANSI and EN (DIN), as well as proprietary chamber flanges, are available. See "Proprietary Flanges" on page 137 to identify the proprietary flanges.
- See "Centering discs" on page 118 for which disc to use.
- See Table A-6 on page 117 for guidelines on the required probe length.

For additional information, see the Replacing Displacers with Guided Wave Radar Technical Note (document number 00840-2200-4811).

Table A-6. Required Probe Length in Chambers

Chamber manufacturer	Probe length(1)
Major torque-tube manufacture (249B, 249C, 249K, 249N, 259B)	Displacer + 9 in. (229 mm)
Masoneilan (Torque tube operated), proprietary flange	Displacer + 8 in. (203 mm)
Other - torque tube(2)	Displacer + 8 in. (203 mm)
Magnetrol (spring operated)(3)	Displacer + between 7.8 in. (195 mm) to 15 in. (383 mm)
Others - spring operated(2)	Displacer + 19.7 in. (500 mm)

(1) If flushing ring is used, add the ring height to the probe length.
(2) For other manufacturers, there are small variations. This is an approximate value, actual length should be verified.
(3) Lengths vary depending on model, SG and rating, and should be verified.

Probe type in chamber considerations

When installing a Rosemount 3308 in a chamber, the single lead probe is recommended. The probe length determines if a Single Rigid or Single Flexible probe should be used:

- Less than 19.7 ft. (6.0 m):
  Rigid Single Probe is recommended. Use a centering disc for probe > 3.3 ft. (1 m). When mounting space is limited, use a Flexible Single Probe with a heavy weight (option W3) and centering disc.
- More than 19.7 ft. (6.0 m):
  Use Flexible Single Probe with a heavy weight (option W3) and centering disc.

Centering discs

To prevent the probe from contacting the chamber or pipe wall, centering discs are available for rigid single, flexible single, and flexible twin lead probes. The disc is attached to the end of the probe. Discs are made of stainless steel or PTFE. See Table A-7 on page 118 for Dimension D. Table A-8 on page 118 shows which centering disc diameter to choose for a particular pipe.

Figure A-12. Dimension D for Centering Discs

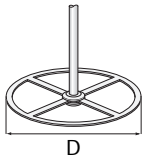


Table A-7. Centering Discs Dimensions

Disc size	Actual disc diameter (Dimension D)
2 in.	1.8 in. (45 mm)
3 in.	2.7 in. (68 mm)
4 in.	3.6 in. (92 mm)
6 in.	5.55 in. (141 mm)
8 in.	7.40 in. (188 mm)

Table A-8. Centering Disc Size Recommendation for Different Pipe Schedules

Pipe size	Pipe schedule			
	5s, 5 & 10s,10	40s, 40 & 80s, 80	120	160
2 in.	2 in.	2 in.	N/A(1)	N/A(2)
3 in.	3 in.	3 in.	N/A(1)	2 in.
4 in.	4 in.	4 in.	4 in.	3 in.
5 in.	4 in.	4 in.	4 in.	4 in.
6 in.	6 in.	6 in.	4 in.	4 in.
7 in.	N/A(1)	6 in.	N/A(1)	N/A(1)
8 in.	8 in.	8 in.	6 in.	6 in.

(1) Schedule is not available for pipe size.
(2) No centering disc is available.

A.4 Ordering information

Specification and selection of product materials, options, or components must be made by the purchaser of the equipment. See page 111 for more information on Material Selection.

Table A-9. 3308 Series Level and/or Interface Measurements in Liquids Ordering Information

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Model	Product description		
3308A	Guided Wave Radar Level Transmitter		★
Profile			
S	Standard		★
Signal output (see page 101 for details)			
X	Wireless		★
Measurement type (see page 106)			
2	Level and Interface Transmitter		★
1	Level or Interface Transmitter (Interface available for fully submerged probe)		
Housing			
D1	Wireless Dual Compartment Housing, Aluminum (with plugged ½-14 NPT conduits)		★
E1	Wireless Dual Compartment Housing, Stainless steel (with plugged ½-14 NPT conduits)		★
Product certifications (see Appendix B: Product Certifications)			
I1	ATEX Intrinsic Safety		★
I5	FM Intrinsically Safe		★
I6	Canadian Intrinsically Safe		★
I7	IECEx Intrinsic Safety		★
EM	Technical Regulations Customs Union (EAC) Flameproof (consult factory for details)		
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety (consult factory for details)		
KD	ATEX and Canadian Intrinsic Safety		
KE	FM and Canadian Intrinsically Safe		
KF	ATEX and FM Intrinsic Safety		
NA	No Hazardous Locations Certifications		
Operating temperature and pressure (see page 104)			
S	- 15 psig (-1bar) to 580 psig (40 bar) @ 302 °F (150 °C)		★
Material of construction; process connection / probe		**Probe type**	
1	316L SST (EN 1.4404)	All	★
7	PTFE covered probe and flange. With plate design.	4A and 5A	
8	PTFE covered probe	4A and 5A	

Table A-9. 3308 Series Level and/or Interface Measurements in Liquids Ordering Information

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Sealing o-ring material (see Table A-1 on page 104)			
V	Viton Fluoroelastomer		★
E	Ethylene Propylene (EPDM)		★
K	Kalrez 6375 Perfluoroelastomer		★
B	Nitrile Butadiene (NBR)		★
Process connection size (see Table A-10 on page 123 for availability)		**Process connection type**	
5	1½ in.	Thread / Tri-Clamp	★
2	2 in. / DN50 / 50A	NPT Thread / Flange / Tri-Clamp	★
3	3 in. / DN80 / 80A	Flange / Tri-Clamp	★
4	4 in. / DN100 / 100A	Flange / Tri-Clamp	★
P	Proprietary Flanges	Proprietary Flange	★
1	1 in.	Thread	
6	6 in. / DN150 / 150A	Flange	
8	8 in. / DN200 / 200A	Flange	
Process connection rating (see Table A-10 on page 123 for availability)			
NN	For use with non-flange process connection type		★
ASME rating			
AA	ASME B16.5 Class 150 Flange		★
AB	ASME B16.5 Class 300 Flange		★
EN rating			
DA	EN1092-1 PN16 Flange		★
DB	EN1092-1 PN40 Flange		★
JIS rating			
JA	JIS B2220 10K Flange		★
JB	JIS B2220 20K Flange		★
Proprietary			
PF	Proprietary Flange		★
Process connection type (threads / flange faces / proprietary flanges / Tri-Clamp) (see Table A-10 on page 123 for availability)			
Threads			
N	NPT thread		★
G	BSP (G) thread		★
Flange faces			
F	Flat Face (FF) Flange, available for EN flanges		★
R	Raised Face (RF) Flange, available for ASME and JIS flanges		★

Table A-9. 3308 Series Level and/or Interface Measurements in Liquids Ordering Information

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Proprietary flanges (see page 137 for dimensions)				
M	Masoneilan-Proprietary, 316 SST Torque Tube Flange, 316L			★
P	Fisher-Proprietary, 316 SST, (for 249B and 259B cages) Torque Tube Flange, 316L			★
Q	Fisher-Proprietary, 316 SST, (for 249C cages) Torque Tube Flange, 316L			★
Tri-Clamp				
C	Tri-Clamp			
Probe Type		**Process connection type**	**Probe lengths**	
3B	Coaxial, perforated. For level and interface measurement.	Flange / 1-in., 1½-in., 2-in. Thread	Min.: 1 ft. 4 in. (0.4 m) Max.: 19 ft. 8 in. (6 m)	★
4A	Rigid Single Lead (d=0.3”/8mm)	Flange / 1-in., 1½-in., 2-in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m)(1) Max.: 9 ft. 10 in. (3 m)	★
4B	Rigid Single Lead (d=0.5”/13mm)	Flange / 1½-in, 2-in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m) Max.: 19 ft. 8 in. (6 m)	★
5A	Flexible Single Lead (d=0.16”/4mm). Refer to “Options” on page 122 to specify weight or chuck.	Flange / 1-in., 1½-in., 2-in. Thread / Tri-Clamp	Min.: 3 ft. 4 in. (1 m)(1) Max.: 55 ft. 9 in. (17 m)	★
2A	Flexible Twin Lead with weight	Flange / 1½-in, 2-in. Thread	Min.: 3 ft. 4 in. (1 m) Max.: 55 ft. 9 in. (17 m)	
3A	Coaxial (for level measurement)(2)	Flange / 1-in., 1½-in., 2-in. Thread	Min.: 1 ft. 4 in. (0.4 m) Max.: 19 ft. 8 in. (6 m)	
Probe length units (see page 113 for total probe length)				
E	English (feet, inches)			★
M	Metric (meters, centimeters)			★
Probe length (feet / meters)				
XXX	0-55 feet or 0-17 meters			★
Probe length (inches / centimeters)				
XX	0-11 inches or 0-99 Centimeters			★
Update rate, operating frequency and protocol				
WA3	User Configurable Update Rate, 2.4 GHz DSSS (Direct Sequence Spread Spectrum), IEC 62591 (*Wireless*HART)			★
Omnidirectional wireless antenna and SmartPower solutions (see page 102 for functional specification)				
WK1	External Antenna, Adapter for Black Power Module (I.S. Power Module Sold Separately)			★
WN1(3)	High Gain, Remote Antenna (see page 136 for dimensions), Adapter for Black Power Module (I.S. Power Module Sold Separately)			★

Table A-9. 3308 Series Level and/or Interface Measurements in Liquids Ordering Information

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Options		
Display		
M5	Device Display (see page 102)	★
Factory configuration		
C1	Factory Configuration (Configuration Data Sheet required with order, available at www.rosemount.com)	★
Certifications		
P1	Hydrostatic Testing	★
Q4	Calibration Data Certificate	★
Q8	Material Traceability Certification per EN 10204 3.1	★
Q66	Welding Procedure Qualification Record Documentation	
Installation options		
LS	Long Stud for Flexible Single Lead Probes, 25 cm (10 in.) (for use in tall nozzles)	★
BR	Mounting Bracket for 1½-in. NPT Process Connection (see page 135)	
Weight and anchoring options for flexible single probes (see page 112 for dimensions)		
W1	Small Weight (for narrow tank openings less than 2 in. (50 mm)) (Required for PTFE covered probes)	★
W3	Heavy Weight (for most applications)	★
W4	Chuck (to tie probe end to tank bottom)	★
W2	Short Weight (when measuring close to the probe end)	
Weight assembly options for flexible single probes		
WU	Weight or chuck not mounted on the probe	★
PlantWeb diagnostic Functionality		
DA1	HART® Diagnostics (see page 103)	★
Centering disc (see page 118 for dimensions and size recommendation)[4]		
S2	2-in. Centering disc[5]	★
S3	3-in. Centering disc[5]	★
S4	4-in. Centering disc[5]	★
P2	2-in. Centering disc PTFE	★
P3	3-in. Centering disc PTFE	★
P4	4-in. Centering disc PTFE	★
S6	6-in. Centering disc[5]	
S8	8-in. Centering disc[5]	
P6	6-in. Centering disc PTFE	
P8	8-in. Centering disc PTFE	
Assemble / consolidate to chamber (see page 115)		
XC	Consolidate to Chamber	★

Table A-9. 3308 Series Level and/or Interface Measurements in Liquids Ordering Information

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Engineered solutions (see page 115)		
Pxxx	Engineered Solutions beyond standard model codes. (Consult factory for details)	

(1) Minimum probe length is 4 ft 11 in. (1.5 m) for PTFE covered probes (Material of Construction codes 7 and 8).
(2) Requires model 3308Axx1.
(3) Not CE approved.
(4) Available for probe types 2A, 4A, 4B, and 5A. Not available with PTFE covered probes (Material of Construction codes 7 and 8).
(5) Centering disc in same material as probe material of construction.

Table A-10. Availability of Process Connections (Type vs. Size and Rating)

Size	**Rating**							
	NN	**AA**	**AB**	**DA**	**DB**	**JA**	**JB**	**PF**
5	N, G,C	-	-	-	-	-	-	-
2	N, C	R	R	F	F	R	R	-
3	C	R	R	F	F	R	R	-
4	C	R	R	F	F	R	R	-
P	-	-	-	-	-	-	-	M, P, Q
1	N, G	-	-	-	-	-	-	-
6	-	R	R	F	F	R	R	-
8	-	R	R	F	F	R	R	-

- Not available

A.5 Spare parts and accessories

Table A-11. 3308 Series Spare Parts List - Transmitter Head

Model	Product description
3308A	Guided Wave Radar Level Transmitter
Profile	
S	Standard
Signal output (see page 101 for details)	
X	Wireless
Measurement type (see page 106)	
2	Level and Interface Transmitter
1	Level or Interface Transmitter (Interface available for fully submerged probe)
Housing	
D1	Wireless Dual Compartment Housing, Aluminum (with plugged ½-14 NPT conduits)
E1	Wireless Dual Compartment Housing, Stainless steel (with plugged ½-14 NPT conduits)
Product certifications (see Appendix B: Product Certifications)	
I1	ATEX Intrinsic Safety
I5	FM Intrinsically Safe
I6	Canadian Intrinsically Safe
I7	IECEx Intrinsic Safety
EM	Technical Regulations Customs Union (EAC) Flameproof (consult factory for details)
IM	Technical Regulations Customs Union (EAC) Intrinsic Safety (consult factory for details)
KD	ATEX and Canadian Intrinsic Safety
KE	FM and Canadian Intrinsically Safe
KF	ATEX and FM Intrinsic Safety
NA	No Hazardous Locations Certifications
Operating temperature and pressure	
N	Not Applicable
Material of construction; process connection / probe	
0	Not Applicable
Sealing o-ring material	
N	Not Applicable
Process connection size	
N	Not Applicable

Table A-11. 3308 Series Spare Parts List - Transmitter Head

Process connection rating	
NN	Not Applicable
Process connection type (threads / flange faces / proprietary flanges / Tri-Clamp)	
0	Not Applicable
Probe Type	
0N	Not Applicable
Probe length units	
N	Not Applicable
Probe length (feet / meters)	
000	Not Applicable
Probe length (inches / centimeters)	
00	Not Applicable
Update rate, operating frequency and protocol	
WA3	User Configurable Update Rate, 2.4 GHz DSSS (Direct Sequence Spread Spectrum), IEC 62591 (*Wireless*HART)
Omnidirectional wireless antenna and SmartPower solutions (see page 102 for functional specification)	
WK1	External Antenna, Adapter for Black Power Module (I.S. Power Module Sold Separately)
WN1(1)	High Gain, Remote Antenna (see page 136 for dimensions), Adapter for Black Power Module (I.S. Power Module Sold Separately)
Options	
Display	
M5	Device Display (see page 102)
Factory configuration	
C1	Factory Configuration (Configuration Data Sheet required with order, available at www.rosemount.com)
Certifications	
Q4	Calibration Data Certificate
PlantWeb diagnostic Functionality	
DA1	HART Diagnostics (see page 103)
Engineered solutions (see page 115)	
Pxxx	Engineered Solutions beyond standard model codes. (Consult factory for details)

(1) Not CE approved.

Table A-12. 3308 Series Spare Parts List - Probe

Model	Product description	
3308A	Guided Wave Radar Level Transmitter	
Profile		
S	Standard	
Signal output		
N	Not Applicable	
Measurement type		
9	Spare Process Seal and Probe	
Housing		
N0	Not Applicable	
Product certifications		
NA	Not Applicable	
Operating temperature and pressure (see page 104)		
S	- 15 psig (-1bar) to 580 psig (40 bar) @ 302 °F (150 °C)	
Material of construction; process connection / probe		**Probe type**
1	316L SST (EN 1.4404)	All
7	PTFE covered probe and flange. With plate design.	4A and 5A
8	PTFE covered probe	4A and 5A
Sealing o-ring material (see Table A-1 on page 104)		
V	Viton Fluoroelastomer	
E	Ethylene Propylene (EPDM)	
K	Kalrez 6375 Perfluoroelastomer	
B	Nitrile Butadiene (NBR)	
Process connection size (see Table A-10 on page 123 for availability)		**Process connection type**
5	1½ in.	Thread / Tri-Clamp
2	2 in. / DN50 / 50A	NPT Thread / Flange / Tri-Clamp
3	3 in. / DN80 / 80A	Flange / Tri-Clamp
4	4in. / DN100 / 100A	Flange / Tri-Clamp
P	Proprietary Flanges	Proprietary Flange
1	1 in.	Thread
6	6 in. / DN150 / 150A	Flange
8	8 in. / DN200 / 200A	Flange

Table A-12. 3308 Series Spare Parts List - Probe

Process connection rating (see Table A-10 on page 123 for availability)			
NN	For use with non-flange process connection type		
ASME rating			
AA	ASME B16.5 Class 150 Flange		
AB	ASME B16.5 Class 300 Flange		
EN rating			
DA	EN1092-1 PN16 Flange		
DB	EN1092-1 PN40 Flange		
JIS rating			
JA	JIS B2220 10K Flange		
JB	JIS B2220 20K Flange		
Proprietary			
PF	Proprietary Flange		
Process connection type (threads / flange faces / proprietary flanges / Tri-Clamp) (see Table A-10 on page 123 for availability)			
Threads			
N	NPT thread		
G	BSP (G) thread		
Flange faces			
F	Flat Face (FF) Flange, available for EN flanges		
R	Raised Face (RF) Flange, available for ASME and JIS flanges		
Proprietary flanges (see page 137 for dimensions)			
M	Masoneilan-Proprietary, 316 SST Torque Tube Flange, 316L		
P	Fisher-Proprietary, 316 SST, (for 249B and 259B cages) Torque Tube Flange, 316L		
Q	Fisher-Proprietary, 316 SST, (for 249C cages) Torque Tube Flange, 316L		
Tri-Clamp			
C	Tri-Clamp		
Probe Type		**Process connection type**	**Probe lengths**
3B	Coaxial, perforated. For level and interface measurement.	Flange / 1-in., 1½-in., 2-in. Thread	Min.: 1 ft. 4 in. (0.4 m) Max.: 19 ft. 8 in. (6 m)
4A	Rigid Single Lead (d=0.3”/8mm)	Flange / 1-in., 1½-in., 2-in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m)(1) Max.: 9 ft. 10 in. (3 m)
4B	Rigid Single Lead (d=0.5”/13mm)	Flange / 1½-in., 2-in. Thread / Tri-Clamp	Min.: 1 ft. 4 in. (0.4 m) Max.: 19 ft. 8 in. (6 m)
5A	Flexible Single Lead (d=0.16”/4mm). Refer to “Options” on page 128 to specify weight or chuck.	Flange / 1-in., 1½-in., 2-in. Thread / Tri-Clamp	Min.: 3 ft. 4 in. (1 m)(1) Max.: 55 ft. 9 in. (17 m)

Table A-12. 3308 Series Spare Parts List - Probe

2A	Flexible Twin Lead with weight	Flange / 1½-in., 2-in. Thread	Min.: 3 ft. 4 in. (1 m) Max.: 55 ft. 9 in. (17 m)
3A	Coaxial (for level measurement)[2]	Flange / 1-in., 1½-in., 2-in. Thread	Min.: 1 ft. 4 in. (0.4 m) Max.: 19 ft. 8 in. (6 m)
Probe length units (see page 113 for total probe length)			
E	English (feet, inches)		
M	Metric (meters, centimeters)		
Probe length (feet / meters)			
XXX	0-55 feet or 0-17 meters		
Probe length (inches / centimeters)			
XX	0-11 inches or 0-99 Centimeters		
Options			
Certifications			
P1	Hydrostatic Testing		
Q8	Material Traceability Certification per EN 10204 3.1		
Q66	Welding Procedure Qualification Record Documentation		
Installation options			
LS	Long Stud for Flexible Single Lead Probes, 25 cm (10 in.) (for use in tall nozzles)		
BR	Mounting Bracket for 1½-in. NPT Process Connection (see page 135)		
Weight and anchoring options for flexible single probes (see page 112 for dimensions)			
W1	Small Weight (for narrow tank openings less than 2 in. (50 mm)) (Required for PTFE covered probes)		
W3	Heavy Weight (for most applications)		
W4	Chuck (to tie probe end to tank bottom)		
W2	Short Weight (when measuring close to the probe end)		
Weight assembly options for flexible single probes			
WU	Weight or chuck not mounted on the probe		
Centering disc (see page 118 for dimensions and size recommendation)[3]			
S2	2-in. Centering disc[4]		
S3	3-in. Centering disc[4]		
S4	4-in. Centering disc[4]		
P2	2-in. Centering disc PTFE		
P3	3-in. Centering disc PTFE		
P4	4-in. Centering disc PTFE		
S6	6-in. Centering disc[4]		
S8	8-in. Centering disc[4]		
P6	6-in. Centering disc PTFE		
P8	8-in. Centering disc PTFE		

Table A-12. 3308 Series Spare Parts List - Probe

Assemble / consolidate to chamber (see page 115)	
XC	Consolidate to Chamber
Engineered solutions (see page 115)	
Pxxx	Engineered Solutions beyond standard model codes. (Consult factory for details)

(1) Minimum probe length is 4 ft 11 in. (1.5 m) for PTFE covered probes (Material of Construction codes 7 and 8).
(2) Requires model 3308Axx1.
(3) Available for probe types 2A, 4A, 4B, and 5A. Not available with PTFE covered probes (Material of Construction codes 7 and 8).
(4) Centering disc in same material as probe material of construction.

Table A-13. Accessories Ordering Information

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

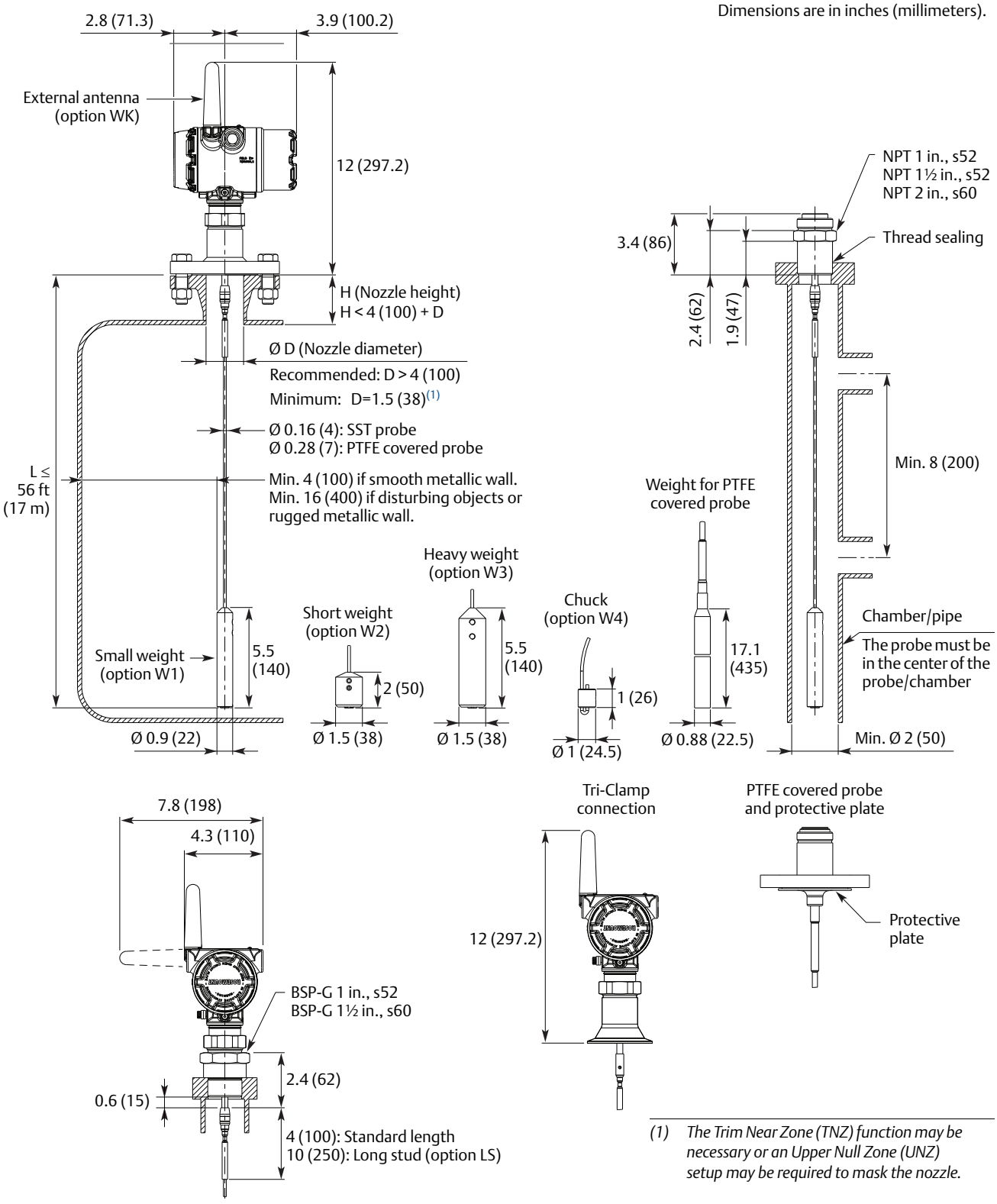
Process connection - size/type (consult the factory for other process connections)			
Centering discs[1][2] (see page 118 for dimensions and size recommendation)		**Outer diameter**	
03300-1655-1001	Kit, 2-in. Centering disc, SST, Single Flex Lead	1.8 in. (45 mm)	★
03300-1655-1002	Kit, 3-in. Centering disc, SST, Single Flex Lead	2.7 in. (68 mm)	★
03300-1655-1003	Kit, 4-in. Centering disc, SST, Single Flex Lead	3.6 in. (92 mm)	★
03300-1655-1006	Kit, 2-in. Centering disc, PTFE, Single Flex Lead	1.8 in. (45 mm)	★
03300-1655-1007	Kit, 3-in. Centering disc, PTFE, Single Flex Lead	2.7 in. (68 mm)	★
03300-1655-1008	Kit, 4-in. Centering disc, PTFE, Single Flex Lead	3.6 in. (92 mm)	★
03300-1655-1004	Kit, 6-in. Centering disc, SST, Single Flex Lead	5.55 in. (141 mm)	
03300-1655-1005	Kit, 8-in. Centering disc, SST, Single Flex Lead	7.40 in. (188 mm)	
03300-1655-1009	Kit, 6-in. Centering disc, PTFE, Single Flex Lead	5.55 in. (141 mm)	
03300-1655-1010	Kit, 8-in. Centering disc, PTFE, Single Flex Lead	7.40 in. (188 mm)	
Vented flanges[3]			
03300-1812-0092	Fisher 249B/259B[4]		
03300-1812-0093	Fisher 249C		
03300-1812-0091	Masoneilan		
Flushing connection rings			
DP0002-2111-S6	2 in. ANSI, ¼ in. NPT connection		
DP0002-3111-S6	3 in. ANSI, ¼ in. NPT connection		
DP0002-4111-S6	4 in. ANSI, ¼ in. NPT connection		
DP0002-5111-S6	DN50 ¼ in. NPT. connection		
DP0002-8111-S6	DN80 ¼ in. NPT. connection		
Other			
03300-7004-0001	MACTek® Viator® HART Modem and cables (RS232 connection)		★
03300-7004-0002	MACTek Viator HART Modem and cables (USB connection)		★

(1) If a centering disc is required for a flanged probe, the centering disc can be ordered with options Sx or Px on page 122 in the model code. If a centering disc is required for a threaded connection or as a spare part, it should be ordered using the item numbers listed below.
(2) To order a centering disc in a different material, consult the factory.
(3) 1½ in. NPT threaded connection is required.
(4) For pressure and temperature rating, see "Fisher® & Masoneilan® flange rating" on page 105.

A.6 Dimensional drawings

Figure A-13. Flexible Single Lead Probe

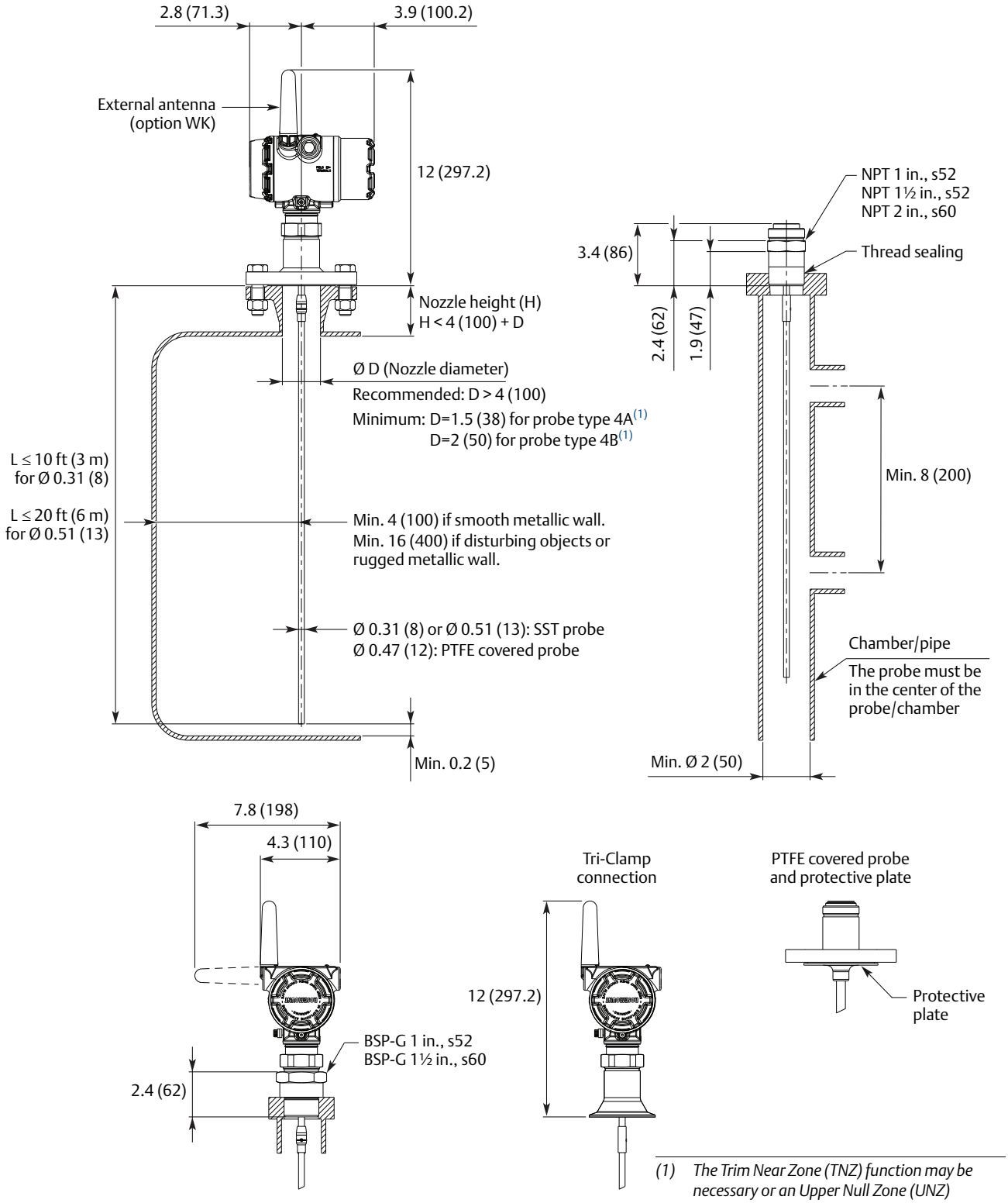
Dimensions are in inches (millimeters).



(1) The Trim Near Zone (TNZ) function may be necessary or an Upper Null Zone (UNZ) setup may be required to mask the nozzle.

Figure A-14. Rigid Single Lead Probe

Dimensions are in inches (millimeters).



(1) The Trim Near Zone (TNZ) function may be necessary or an Upper Null Zone (UNZ) setup may be required to mask the nozzle.

Figure A-15. Coaxial Probe

Dimensions are in inches (millimeters).

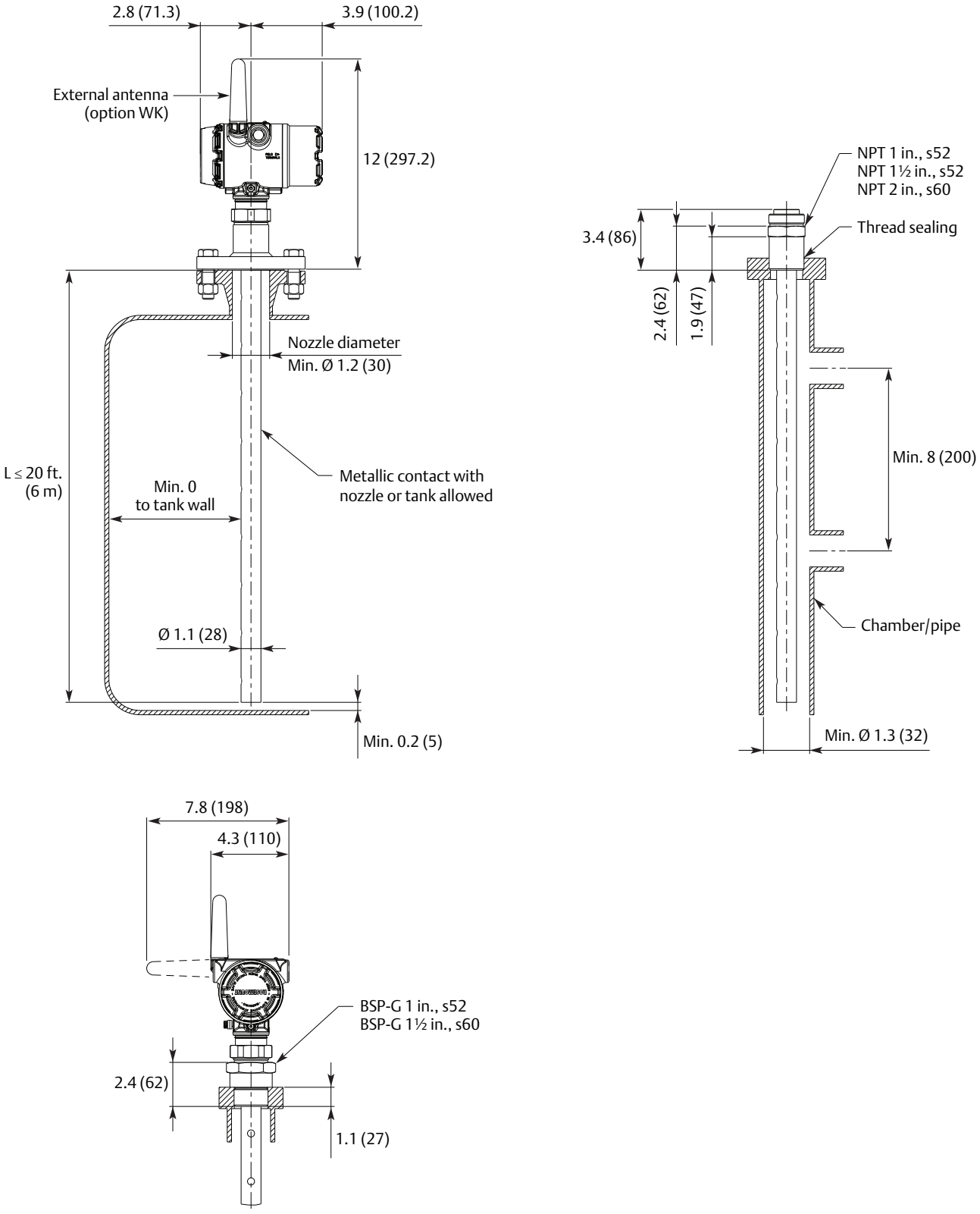
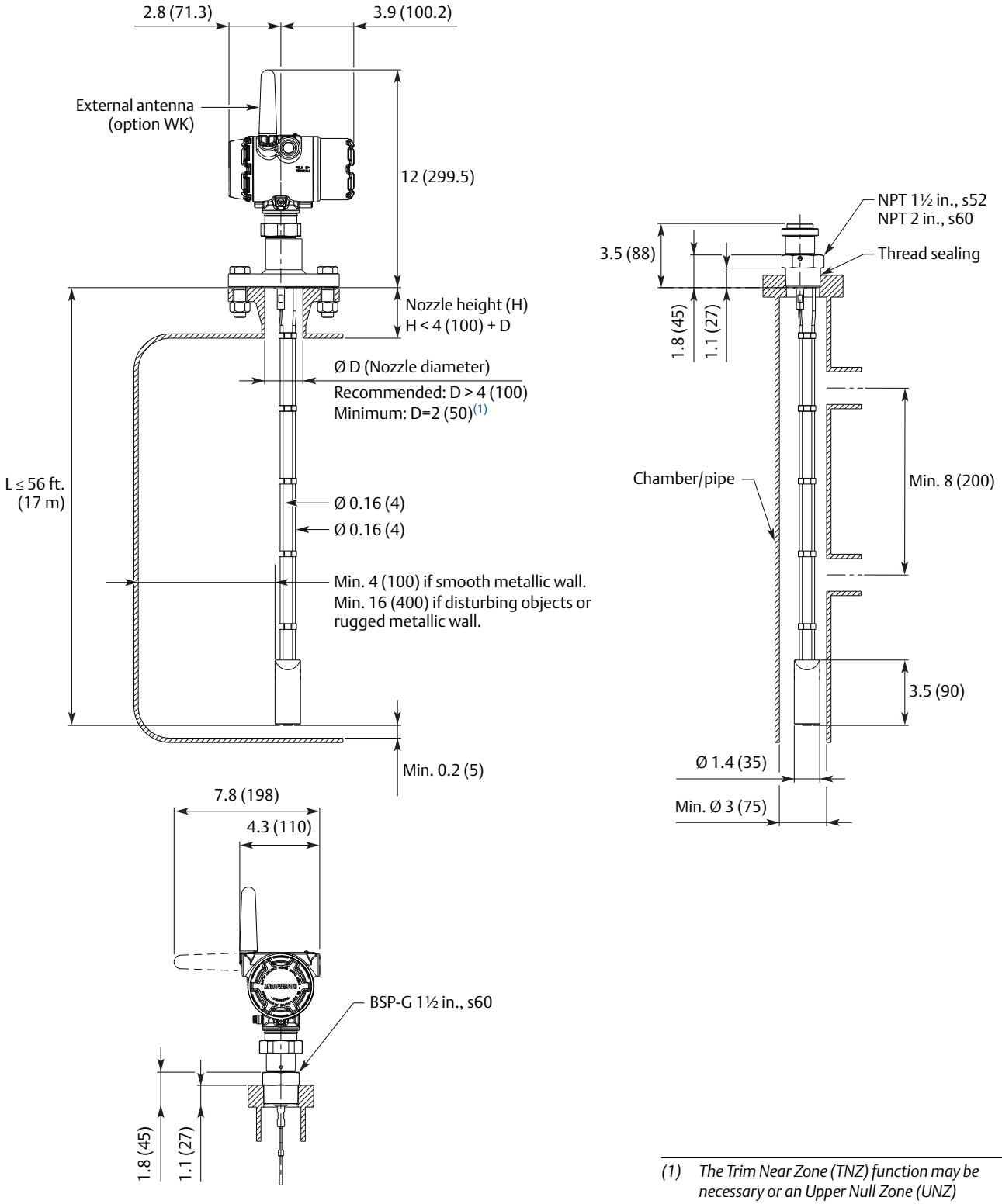


Figure A-16. Flexible Twin Lead Probe

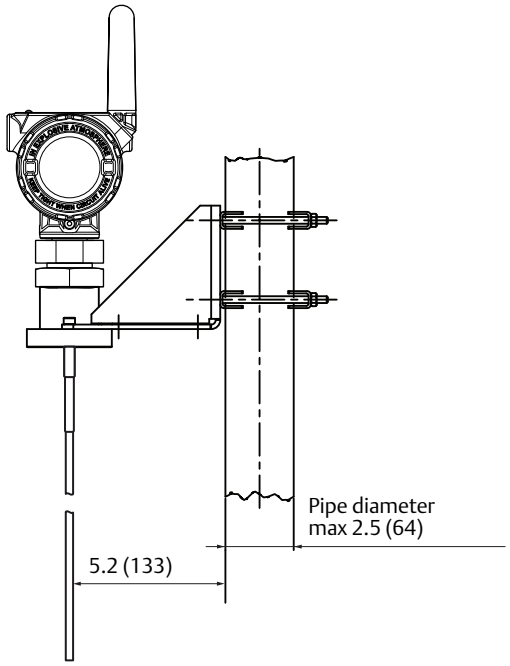
Dimensions are in inches (millimeters).



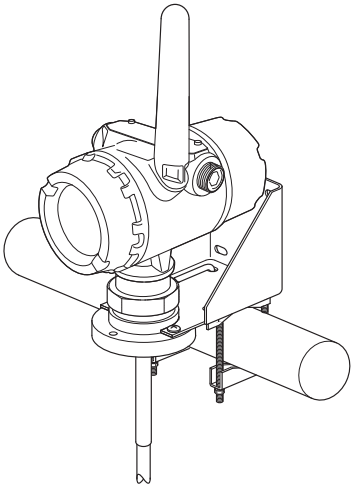
(1) The Trim Near Zone (TNZ) function may be necessary or an Upper Null Zone (UNZ) setup may be required to mask the nozzle.

Figure A-17. Mounting Bracket (Option Code BR)

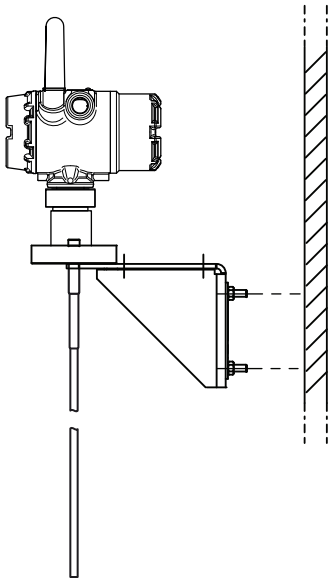
Dimensions are in inches (millimeters).



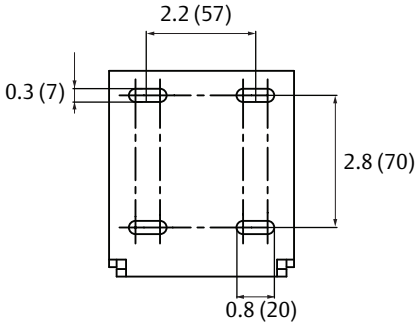
Pipe mounting
(vertical pipe)



Pipe mounting
(horizontal pipe)



Wall mounting



Hole pattern
wall mounting

Figure A-18. High Gain, Remote Antenna (Option Code WN1)

Dimensions are in inches (millimeters).

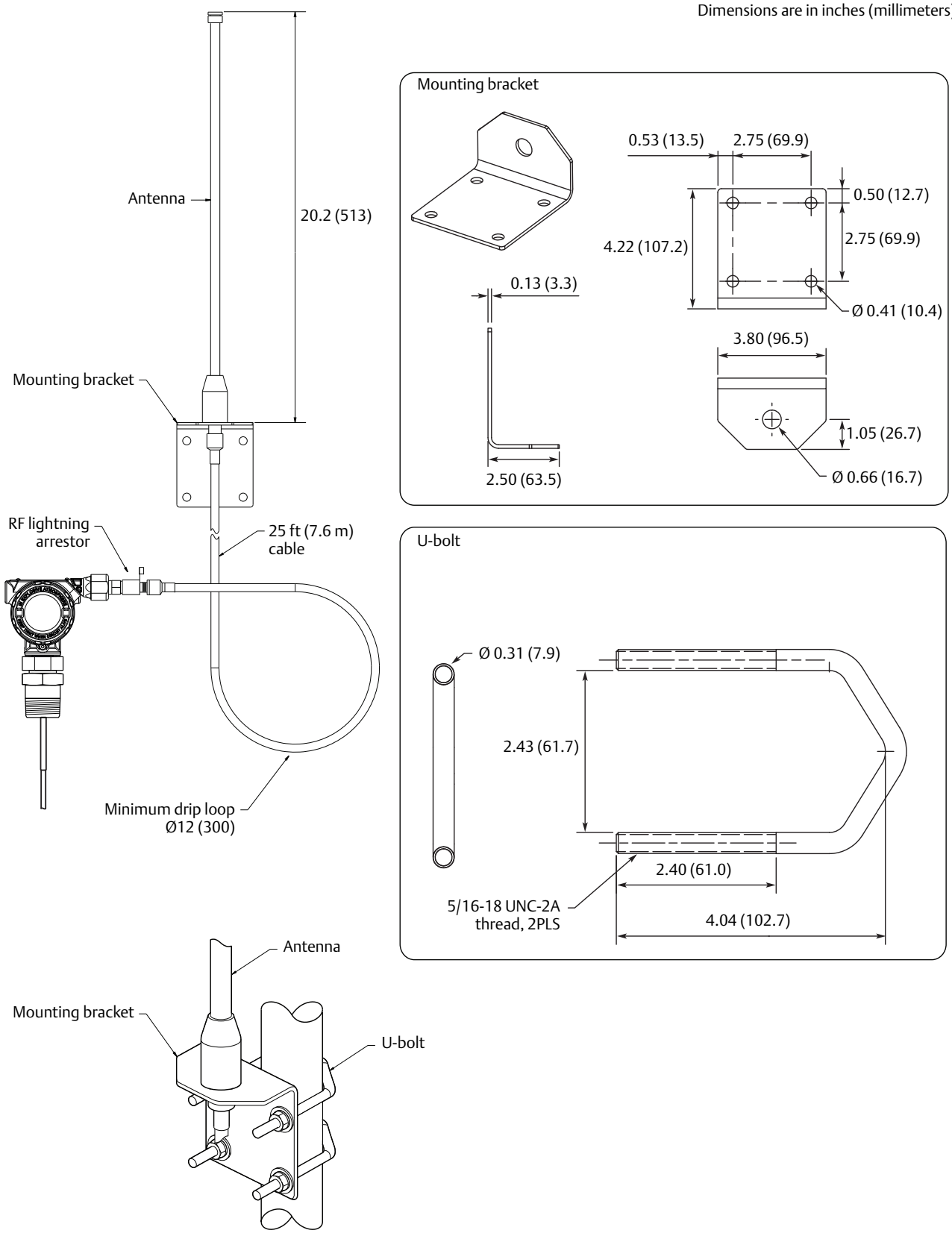
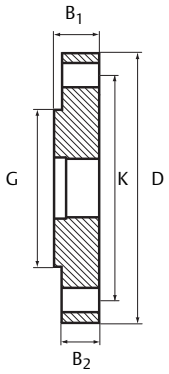
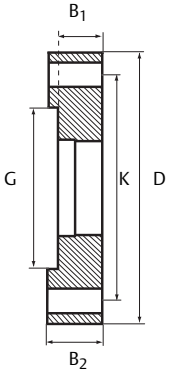


Figure A-19. Proprietary Flanges

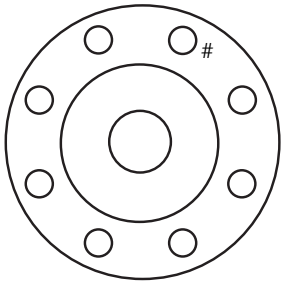
Raised Face



Recessed Face



Dimensions are in inches (millimeters).



D: Outside diameter
B1: Flange thickness with gasket surface
B2: Flange thickness without gasket surface
$F=B_1-B_2$: Gasket surface thickness
G: Gasket surface diameter
Bolts: Number of bolts
K: Bolt hole circle diameter

Note
Dimensions may be used to aid in the identification of installed flanges. It is not intended for manufacturing use.

Table A-14. Dimensions of Proprietary Flanges

Special flanges(1)	D	B_1	B_2	F	G	# Bolts	K
Fisher 249B/259B(2)	9.00 (228.6)	1.50 (38.2)	1.25 (31.8)	0.25 (6.4)	5.23 (132.8)	8	7.25 (184.2)
Fisher 249C(3)	5.69 (144.5)	0.94 (23.8)	1.13 (28.6)	-0.19 (-4.8)	3.37 (85.7)	8	4.75 (120.65)
Masoneilan(2)	7.51 (191.0)	1.54 (39.0)	1.30 (33.0)	0.24 (6.0)	4.02 (102.0)	8	5.87 (149.0)

(1) These flanges are also available in a vented version.
(2) Flange with raised face.
(3) Flange with recessed face.

Appendix B Product Certifications

B.1 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury.

Make sure the transmitter is installed by qualified personnel and in accordance with applicable code of practice.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

⚠ WARNING

Explosions could result in death or serious injury.

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Single lead probes are sensitive for strong electromagnetic fields and therefore not suitable for non-metallic tanks.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

Probes covered with plastic and/or with plastic discs may generate an ignition-capable level of electrostatic charge under certain extreme conditions. Therefore, when the probe is used in a potentially explosive atmosphere, appropriate measures must be taken to prevent electrostatic discharge.

⚠ WARNING

Process leaks could result in death or serious injury.

Handle the transmitter carefully.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

Only qualified personnel should install the equipment.

B.2 Product certifications

B.2.1 European Union Directive Information

The EC Declaration of Conformity for all applicable European directives for this product can be found in the 3308A Product Certifications document (document number 00825-0200-4308). The most current revision is available at www.rosemount.com. A hard copy may be obtained by contacting your local sales representative.

B.2.2 Approved manufacturing locations

Rosemount Inc. - Chanhassen, Minnesota, USA
Rosemount Tank Radar AB - Gothenburg, Sweden
Emerson Process Management Asia Pacific Private Limited- Singapore

B.2.3 ATEX Directives (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

B.2.4 Electro Magnetic Compatibility (EMC) (2004/108/EC)

Meets EN 61326-1:2006 and EN 61326-2-3:2006 if installed in metallic vessels or still pipes.

B.2.5 Radio and Telecommunications Terminal Equipment Directive (R&TTE) (1999/5/EC)

Emerson Process Management complies with the R & TTE Directive.

B.2.6 Telecommunication Compliance

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. Emerson is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

B.2.7 FCC and IC

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference and this device must accept any interference, including any interference that may cause undesired operation of the device. This device must be installed to ensure a minimum antenna separation distance of 20 cm from all persons.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) this device must accept any interference, including any interference that may cause undesired operation of the device.

⚠ CAUTION

Changes or modifications to the equipment not expressly approved by Rosemount Inc. could void the user's authority to operate the equipment.

Cet appareil est conforme à la norme RSS Industrie Canada exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interferences pouvant causer un mauvais fonctionnement du dispositif.

⚠ CAUTION

Les changements ou les modifications apportés à l'équipement qui n'est pas expressément approuvé par Rosemount Inc pourraient annuler l'autorité de l'utilisateur à utiliser cet équipement.

B.2.8 Ordinary Location Certification for FM Approvals

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM Approvals, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

B.2.9 Pressure Equipment Directive (PED)

Complies with 97/23/EC article 3.3.

B.2.10 Hazardous Locations Certificates

North American Certifications

US Approvals

I5 Intrinsically Safe

Certificate No: 3046655

Applicable Standards: FM Class 3600 – 2011, FM Class 3610 – 2010, FM Class 3810 – 2005, NEMA 250 – 2003, ANSI/ISA 60079-0:2009, ANSI/ISA 60079-11:2011, ANSI/ISA 60079-26:2011, ANSI/ISA 60529:2004.

Markings: IS CL I, DIV 1, GP A, B, C, D:
IS CL I Zone 0, AEx ia IIC;
T4 Ta = -55 to +70 °C
WHEN INSTALLED PER ROSEMOUNT DRAWING 03308-1010
(See Figure B-1 on page 149)

Special Conditions of Certification:

1. The Model 3308 transmitter housing contains aluminum, protect the enclosure to avoid a potential risk of ignition due to impact or friction.
2. The surface resistivity of the polymeric antenna is greater than 1GΩ. To avoid electrostatic charge buildup, it must not be rubbed or cleaned with solvents or a dry cloth.
3. For use with the Emerson Process Management 701PBKKF SmartPower Option only.
4. Only the Emerson Process Management 375 or 475 Field Communicator is approved for use with this transmitter.
5. The maximum permitted operating temperature of the Rosemount 3308A transmitter is 70 °C. To avoid the effects of process temperature and other thermal effects care shall be taken to ensure that the “Electronics Temperature” does not exceed 70 °C.

Canadian Approval

I6 Intrinsically Safe

Certificate No: 3046655

Applicable Standards: CSA Std. C22.2 No. 1010.1:04, CSA Std. 22.2 No 94-M91, CSA Std. C22.2 No. 157 – 92, CAN/CSA-C22.2 No. 60079-0:11, CAN/CSA-C22.2 No. 60079-11:11

Markings: INTRINSICALLY SAFE Ex ia
CLASS I, GP A, B, C, D;
CLASS I, Zone 0, Ex ia IIC Ga;
TEMP CODE T4 (-55 °C ≤Ta≤ +70 °C)
WHEN INSTALLED PER ROSEMOUNT DRAWING 03308-1010.
(See Figure B-1 on page 149)

Special Conditions of Certification:

1. The Model 3308 transmitter housing contains aluminum, protect the enclosure to avoid a potential risk of ignition due to impact or friction.
2. The surface resistivity of the polymeric antenna is greater than 1GΩ. To avoid electrostatic charge buildup, it must not be rubbed or cleaned with solvents or a dry cloth.
3. For use with the Emerson Process Management 701PBKKF SmartPower Option only.
4. Only the Emerson Process Management 375 or 475 Field Communicator is approved for use with this transmitter.
5. The maximum permitted operating temperature of the Rosemount 3308A transmitter is 70 °C. To avoid the effects of process temperature and other thermal effects care shall be taken to ensure that the “Electronics Temperature” does not exceed 70 °C.

European Certifications

I1 ATEX Intrinsic Safety

Certificate No: FM 12ATEX0072X

Applicable Standards: EN 60079-0:2012, EN 60079-11: 2012, EN 60079-26:2007

Markings: Category II 1 G, Ex ia IIC T4 Ga (-55 °C ≤Ta≤ +70 °C);

CE 1180

Special Conditions of Certification:

1. The Model 3308 transmitter housing contains aluminum, protect the enclosure to avoid a potential risk of ignition due to impact or friction.
2. The surface resistivity of the polymeric antenna is greater than 1GΩ. To avoid electrostatic charge buildup, it must not be rubbed or cleaned with solvents or a dry cloth.
3. For use with the Emerson Process Management 701PBKKF SmartPower Option only.
4. Only the Emerson Process Management 375 or 475 Field Communicator is approved for use with this transmitter.
5. The maximum permitted operating temperature of the Rosemount 3308A transmitter is 70 °C. To avoid the effects of process temperature and other thermal effects care shall be taken to ensure that the “Electronics Temperature” does not exceed 70 °C.

IECEx Certifications

I7 IECEx Intrinsic Safety

Certificate No: IECEx FMG 12.0029X

Applicable Standards: IEC 60079-0: 2011, IEC 60079-11: 2011, IEC 60079-26:2006

Markings: Ex ia IIC T4 Ga (-55 °C ≤Ta≤ +70 °C)

Special Conditions of Certification:

1. The Model 3308 transmitter housing contains aluminum, protect the enclosure to avoid a potential risk of ignition due to impact or friction.
2. The surface resistivity of the polymeric antenna is greater than 1GΩ. To avoid electrostatic charge buildup, it must not be rubbed or cleaned with solvents or a dry cloth.
3. For use with the Emerson Process Management 701PBKKF SmartPower Option only.
4. Only the Emerson Process Management 375 or 475 Field Communicator is approved for use with this transmitter.
5. The maximum permitted operating temperature of the Rosemount 3308A transmitter is 70 °C. To avoid the effects of process temperature and other thermal effects care shall be taken to ensure that the “Electronics Temperature” does not exceed 70 °C.

Taiwan Certifications

注意！

依據　低功率電波輻射性電機管理辦法
第十二條
　　經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條
　　低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
　　前項合法通信，指依電信法規定作業之無線電通信。

低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

B.2.11 Other certifications

U1 Overfill protection

Certificate: Z-65.16-536

TÜV-tested and approved by DIBt for overfill protection according to the German WHG regulations

B.3 Approval drawings

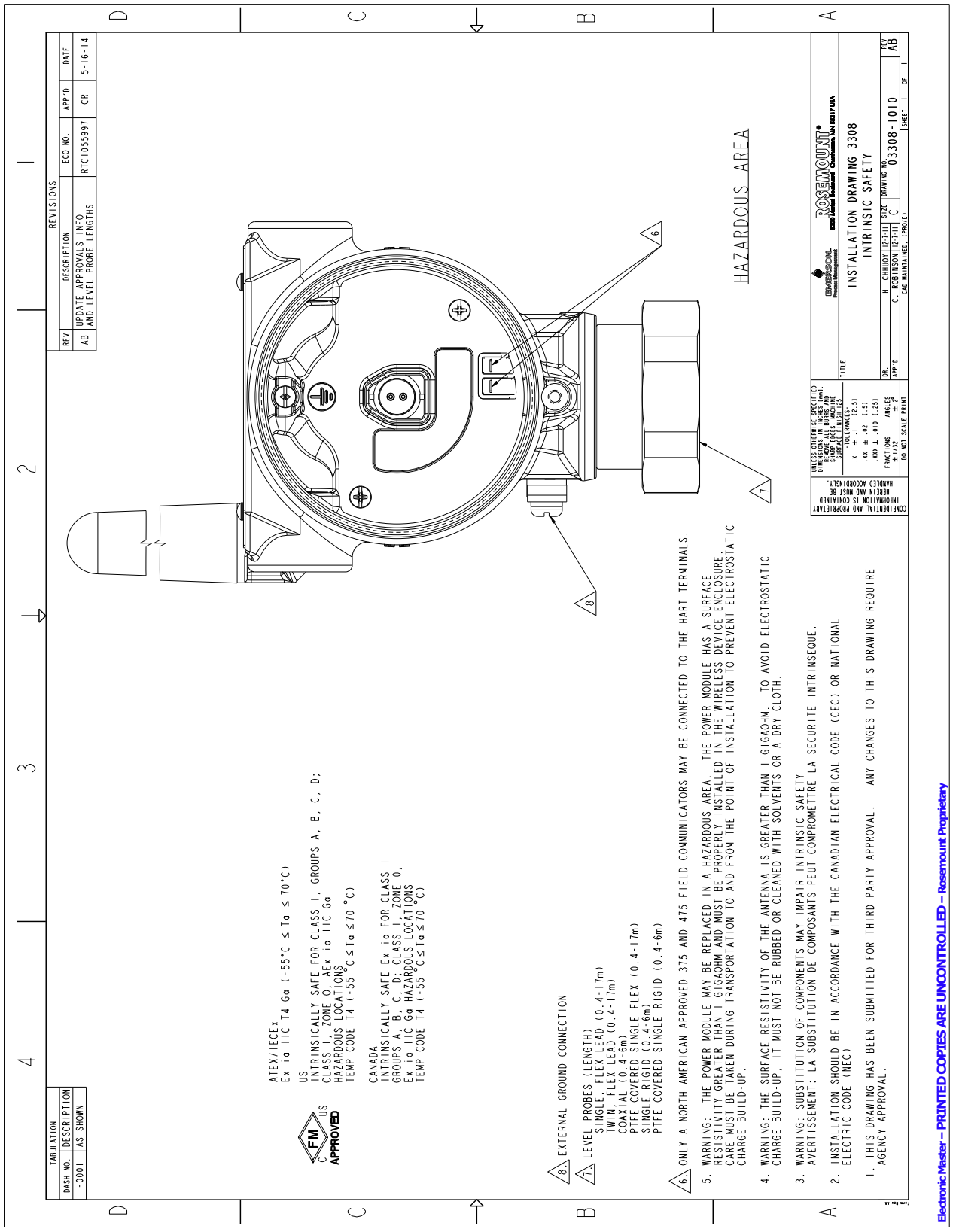
This section contains Factory Mutual installation drawings. The installation guidelines must be followed to maintain certified ratings for installed transmitters.

This section contains the following drawings:

Rosemount drawing 03308-1010:

Installation drawing 3308 FM US and Canada Intrinsic safety

Figure B-1. Installation Drawing 3308 FM & CSA Intrinsic Safety



Appendix C High Gain Remote Antenna Option

C.1 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

When installing remote mount antennas for the wireless field device, always use established safety procedures to avoid falling or contact with high-power electrical lines.

Install remote antenna components for the wireless field device in compliance with local and national electrical codes and use best practices for lightning protection.

Before installing consult with the local area electrical inspector, electrical officer, and work area supervisor.

The wireless field device remote antenna option is specifically engineered to provide installation flexibility while optimizing wireless performance and local spectrum approvals.

To maintain wireless performance and avoid non-compliance with spectrum regulations, do not change the length of cable or the antenna type.

If the supplied remote mount antenna kit is not installed per these instructions, Emerson Process Management is not responsible for wireless performance or non-compliance with spectrum regulations.

Be aware of overhead electrical power lines.

C.2 Functional and physical specifications

C.2.1 General

- Weight: 1.0 lb (0.4 kg
- Ratings: NEMA 4X, and IP66/67
- Vibration: 3g Max vibration

C.2.2 Wireless

- Output: *Wireless*HART® 2.4 GHz DSSS (Direct Sequence Spread Spectrum)
- Communication range: 2/3 mile (3,300 feet) (1.0 km) with L.O.S.
- Radio frequency power output from High Gain, Remote (WN option) antenna: Maximum of 40mW (16dBm) EIRP

C.2.3 Coaxial cable

- Coaxial length: 25 feet (7.6 meters) with Type N Connections
- Coaxial material: Heavy duty, low loss LMR400 cable
- Minimum coaxial bend diameter: 1.0 ft (0.3 meter)

C.2.4 RF Lightning Arrestor

- Type: In-line lightning arrestor
- Electrical connection: Lightning arrestor must be grounded per local electrical codes and regulations.

C.2.5 Mounting bracket

- Horizontal or vertical mast accommodation
- Supported mast diameter: 1.0-2.5 inch (2.5-6.4 cm)
- Aluminum bracket
- Nickel/Zinc plated mounting U-bolts

C.2.6 Antenna

- Remote mount Omni directional Antenna
- Fiberglass & Aluminum construction
- 8 Db Gain
- Meets MIL-STD-810G (Method 510.5, Procedure I and II)

C.3 Review installation considerations

C.3.1 Antenna mounting

Mount antenna vertically (±5°)

C.3.2 Antenna height

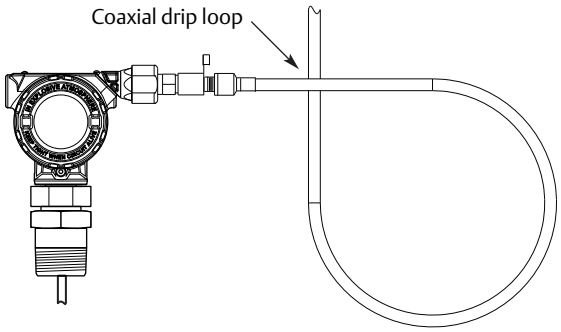
Mount antenna 14 feet (4.3 meters) above infrastructure with clear line of sight.

C.3.3 Affix coaxial cable

Ensure that coaxial cable is securely affixed to the mast to avoid excessive cable movement.

C.3.4 Install coaxial drip loop

Ensure a drip loop is installed not closer than 1 foot (0.3 meters) from the transmitter. It may also be convenient to affix the drip loop to the lower portion of the mast ensuring that condensation or rainwater will flow away from the coaxial connections.



C.3.5 Apply coaxial sealant moisture protection

Utilize the coaxial sealant that is included in the high gain remote mounting kit package. Follow included instructions for application on the coaxial connection.

C.4 Transient/lightning considerations

C.4.1 Gateway transient protection

When installing, consider including transient / lightning protection (not provided) on interface connections (Ethernet, Modbus®, and Coaxial connections) to other equipment.

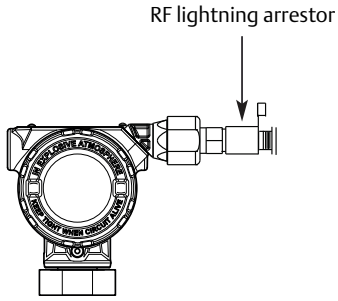
C.4.2 RF lightning arrestor ground connection

Ensure grounding connection is made on the RF lightning arrestor ground connection point.

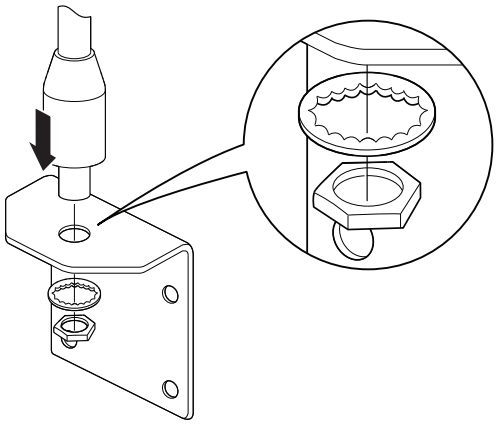
C.5 Install the high gain remote antenna

1. Mount the transmitter following best practice mounting procedures as outlined in Section 3: Installation.

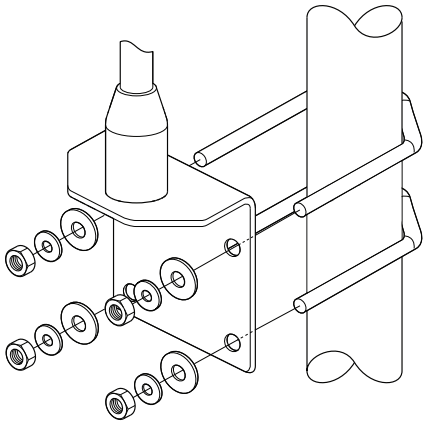
2. Connect the RF lightning arrestor to the device and tighten.



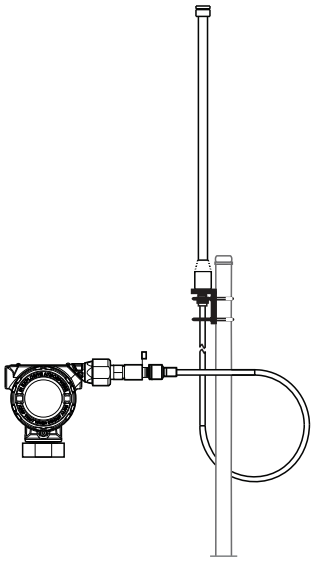
3. Connect the antenna to the mounting bracket and tighten the nut carefully.



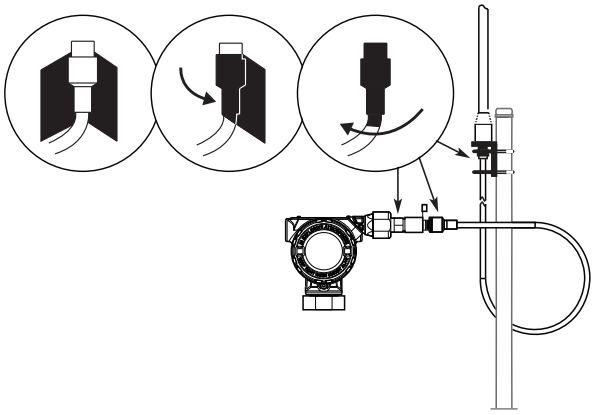
4. Fasten the mounting bracket on the mast. Tighten the nuts loosely first to allow adjustment of the mounting bracket position in step 5.



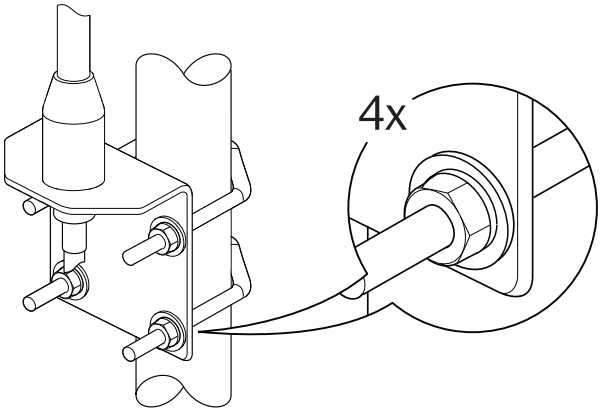
5. Unwind the coaxial cable and connect the cable to both the antenna and the lightning arrestor connected to the transmitter, leaving one loop minimum for a drip loop. Ensure the drip loop is lower than the device, allowing water to flow away from the device.



6. Apply the coaxial sealant around each of the coaxial connections and at the RF lightning arrestor, making sure the RF connections are completely sealed.



7. Tighten the mounting bracket to the mast. Make sure that antenna is pointed in a vertical direction.



Appendix D Configuration Parameters

D.1 Safety messages

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

⚠ WARNING

Failure to follow safe installation and servicing guidelines could result in death or serious injury.

Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

⚠ WARNING

Explosions could result in death or serious injury.

Verify that the operating environment of the gauge is consistent with the appropriate hazardous locations certifications.

Installation of device in an explosive environment must be in accordance with appropriate local, national and international standards, codes, and practices.

Ensure device is installed in accordance with intrinsically safe or non-incendive field practices.

⚠ WARNING

Electrical shock can result in death or serious injury.

Ground device on non-metallic tanks (e.g. fiberglass tanks) to prevent electrostatic charge build-up.

Care must be taken during transportation of power module to prevent electrostatic charge build-up.

Device must be installed to ensure a minimum antenna separation distance of 8 in. (20 cm) from all persons.

⚠ WARNING

Process leaks could result in death or serious injury.

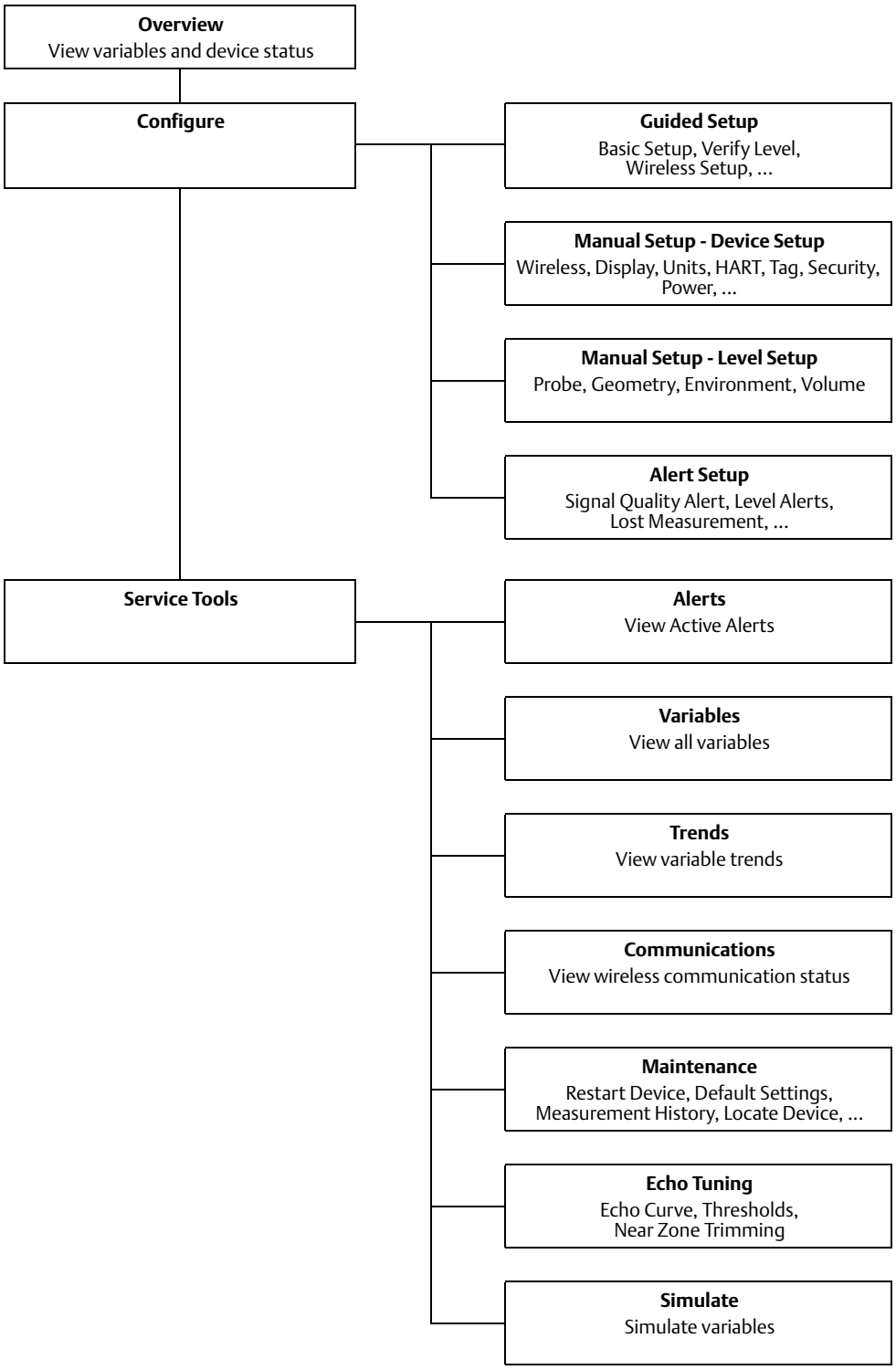
Handle the transmitter carefully.

If the process seal is damaged, gas could escape from the tank when removing the transmitter head from the probe.

Only qualified personnel should install the equipment.

D.2 Menu overview of the Device Descriptor (DD)

This menu is applicable for both the DD in AMS Wireless Configurator and the Field Communicator.



D.3 Configuration parameters

This section presents a brief introduction to all configuration parameters.

The Rosemount 3308 Series Transmitter can be configured for level, volume, interface level, interface distance measurements, and interface thickness.

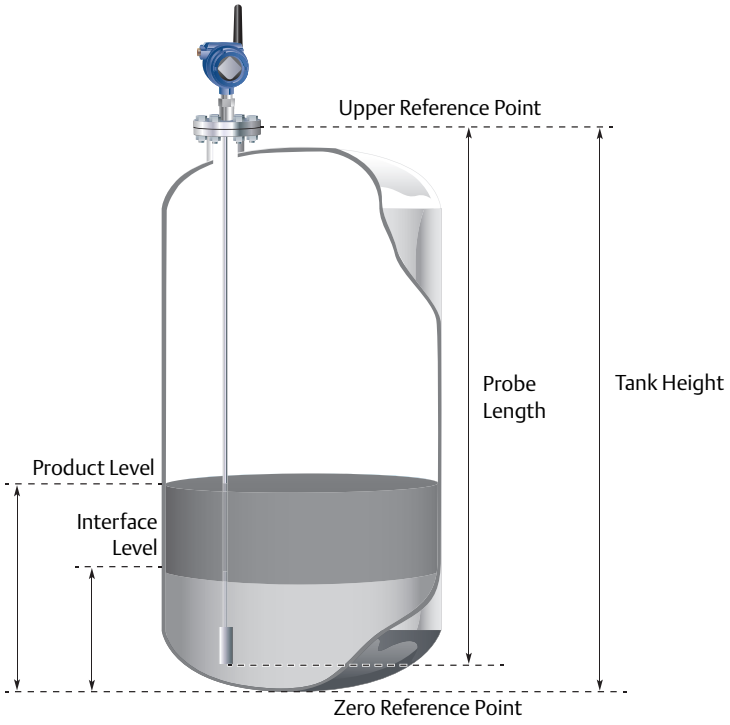
The Rosemount 3308 Series Transmitter can be pre-configured according to the ordering specifications in the Configuration Data Sheet.

D.3.1 Guided Setup

Basic Setup

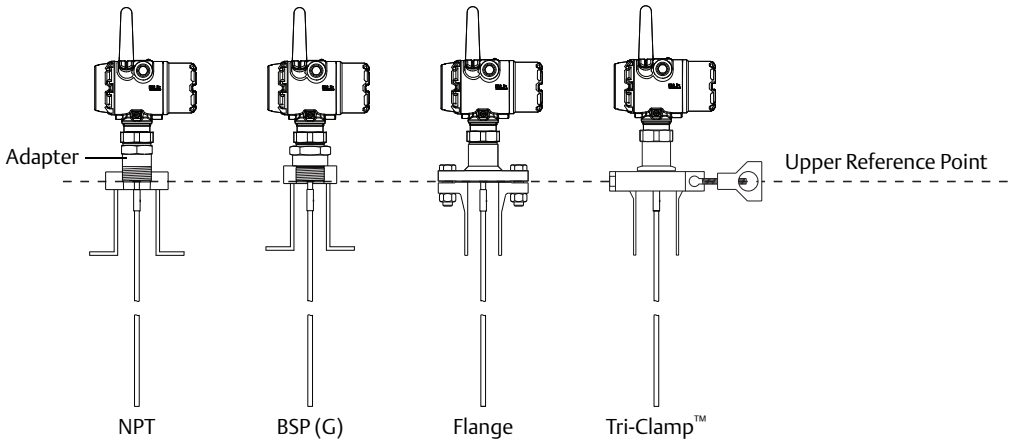
The basic transmitter configuration includes setting the tank geometry parameters. For interface measurements the dielectric constant of the top liquid must also be given. For some applications with heavy vapor, the Vapor Dielectric Constant must be given as well.

Figure D-1. Tank Geometry



For the different tank connections the Upper Reference Point is located at the underside of the threaded adapter or at the underside of the welded flange, as illustrated in Figure D-2 on page 161.

Figure D-2. Upper Reference Point



Probe Type	The transmitter is designed to optimize measurement performance for each probe type. The transmitter automatically makes an initial calibration based on the type of probe that is used. (This parameter is pre-configured at factory and only needs to be set if the probe is changed to another type, or if you have installed a spare transmitter) Select the type of probe that is mounted to the transmitter. Select User Defined probe if your probe can not be found in the list or if you have done modifications to a standard probe.
Probe Length	The probe length is the distance between the Upper Reference Point and the end of the probe, see Figure D-1 on page 160. If a weight is used at the end of the probe it shall be included. This parameter is pre-configured at factory. The probe length must be changed if the probe is shortened, or if you have ordered a spare transmitter head.
Tank Height	The Tank Height is the distance from the Upper Reference Point to the bottom of the tank (Zero Reference Point). See Figure D-1 on page 160. The transmitter measures the distance to the product surface and subtracts this value from the Tank Height to determine the level. When setting the Tank Height, keep in mind that this value is used for all level measurements performed by the Rosemount 3308 Series Transmitter. The Tank Height must be set in linear (level) units, such as feet or meters, regardless of primary variable assignment.
Mounting Type	Select option best describing how device is mounted on the tank.

Inner Diameter, Pipe/Chamber/Nozzle	Select the inner diameter for the pipe, chamber or nozzle in which the probe is mounted.
Nozzle Height	The distance between the Upper Reference Point (normally the lower side of the device flange) and the end of the nozzle. Note that nozzle may extend into the tank (which should be included in the height).
Measurement Mode	Select the Measurement Mode to use in the device. Some modes require software options to be enabled in the device. You can upgrade the device to enable more software options. Interface Level with Submerged Probe is used for applications where the probe is fully immersed in liquid. In this mode the transmitter ignores the upper product level. See "Interface measurements with fully submerged probes" on page 96 for more information. **Note** Only use Interface Level with Submerged Probe for applications where interface is measured for a fully immersed probe.
Upper Product Media	Approximate DC value selected from list based on tank content.

Upper Product Dielectric Constant	Enter the Upper Product Dielectric Constant (DC) as accurately as possible. This value is used for setting the automatically calculated amplitude thresholds. In addition the dielectric constant of the upper product is essential for calculating the interface level and the upper product thickness. The default value for the Upper Product Dielectric Constant is 2. For level measurements, the Upper Product Dielectric Constant parameter corresponds to the dielectric constant of the product in the tank. If the dielectric constant of the lower product is significantly smaller than the dielectric constant of water, you may need to make special adjustments. The dielectric constant of water is 80. See section "Example 2: Interface Peak not found" on page 88 for further information. In case the dielectric constant is unknown, then use the Dielectric Constant Guide embedded in the AMS Wireless Configurator as help when configuring the DC. The AMS Wireless Configurator includes a Dielectric Chart which lists the dielectric constants of a range of products. AMS Wireless Configurator also includes a tool which allows you to calculate dielectric constants based on measurements of the Upper Product Thickness. 1. From the *Home* Screen, go to **Configure > Manual Setup > Level Setup > Environment**. 2. Click **Dielectric Constant Guide** and follow the on-screen instructions.
Maximum Product Level Rate	Fastest rate that may occur in the monitored process to (partially) fill or empty this tank. Will be used to calculate the maximum level change between updates. Note that product level rate may be higher during upset conditions. **Note** If the tank is filling or emptying at a high rate, set a faster Update Rate to make sure there is enough safety margin in the system for High/Low Alerts. Run Check Level Response to make sure that configured Update Rate is sufficient for the application, refer to section "Optional Setup" on page 58.
Tank Material	Select material of construction of the tank.

Typical Interface Condition	The typical interface condition in the tank. Select one of the following conditions: **Typical Interface Condition** / **Description** Unknown or Other condition — The typical interface condition is unknown, or varies in such a way that no typical interface condition can be stated. Layer on top (thin) — The interface thickness is typically thin compared to the bottom layer. The tank mostly contains the bottom product. Layer at the bottom (thin) — The interface thickness is typically thick compared to the bottom layer. The tank mostly contains the upper product.

D.3.2 Manual Setup - Device

Wireless - Network

Network ID	Identification number that tells the device which network it belongs to. Obtained from the network administrator.
Join Key	A kind of password that the device uses to join the network. Obtained from the network administrator. All sections must contain the same number of characters.

Wireless - Broadcasting

Message Content	Which content (HART command) to broadcast for a message.
Message Variables	Which variables that are included in the content.
Trigger Mode	How message will be triggered.
Trigger Level	At which level message will be triggered.
First and Trigger Variable	The 1st variable contained within message which also will be used to trigger a broadcast.
Triggered Update Rate	This defines how often the broadcast message is sent to the gateway after a user defined trigger level threshold has been crossed. Faster update rates have an impact on the total communications traffic on the network, and power module life.
Default Update Rate	This defines how often the broadcast message is sent to the gateway. Faster update rates have an impact on the total communications traffic on the network, and power module life.

Device Display

<table>
<tr><td>Display Mode</td><td>The display can be configured to different display modes: Disabled, On Demand, or Periodic.

<table>
<tr><th>Display Mode</th><th>Description</th></tr>
<tr><td>Disabled</td><td>The display is always turned off.</td></tr>
<tr><td>On Demand</td><td>The display is by default turned off. Selected variable screens will only appear in the end of the diagnostic button screen sequence, refer to “Diagnostic button screen sequence” on page 64.</td></tr>
<tr><td>Periodic</td><td>The display shows selected variable screens in a periodic sequence. A new screen will appear on each wireless update.</td></tr>
</table>
</td></tr>
<tr><td>Display Variables</td><td>As default, the level variable will be displayed. If more than one variable is configured, the display will toggle between the values of the chosen variables.</td></tr>
</table>

Units

The units for length, volume, and temperature are selectable. After appropriate units have been selected, all configuration parameters and transmitter variables will be expressed in these units.

Length Unit	Used unit for Level and Interface Level values.
Volume Unit	Used unit for Volume values.
Temperature Unit	Used unit for Electronics Temperature value.

HART - Variable Mapping

Primary Variable	Primary dynamic variable in the HART protocol which will be assigned as a variable from the device.
Secondary Variable	Second dynamic variable in the HART protocol which will be assigned as a variable from the device.
Third Variable	Third (Tertiary) dynamic variable in the HART protocol which will be assigned as a variable from the device.
Fourth Variable	Fourth (Quaternary) dynamic variable in the HART protocol which will be assigned as a variable from the device.

HART - Percent of Range

Upper Range Value	Value for Primary Variable (PV) corresponding to 100% range.
Lower Range Value	Value for Primary Variable (PV) corresponding to 0% range.
Upper Sensor Limit	The upper boundary for the range over which the sensor works properly.
Lower Sensor Limit	The lower boundary for the range over which the sensor works properly.

HART - Data Collection

Measurement and Status Log	Alternatives for data collection in the device.

HART - Variable History

Configure Data History	Data History is a series of 12 data points stored in the transmitter. To enable Data History trending select either to enable single data point trending (recommended) or enable filtered trending. If Data History is enabled, select which Device Variable to store, and then type the time between each sample into the Sample Interval box (4 to 7200 seconds).

Security

Write Protection	The device configuration can be write protected.
Over the Air Upgrade	Wireless upgrade of radio software is possible.
HART Lock Status	The state of HART write lock in the device.

Device Information

Tag	Identifier for the device (max 8 characters) used by host systems. It is recommended to enter both a short and a long tag (they may be the same).
Long Tag	Identifier for the device (max 32 characters) used by host systems. It is recommended to enter both a short and a long tag (they may be the same).
Descriptor	User's own description. Not required for operation of the device and can be left out if desired.
Message	User's own information. Not required for operation of the device and can be left out if desired.
Date	User's own information. Manufacturing date by default. Not required for operation of the device and can be left out if desired.

Power

Performance Mode

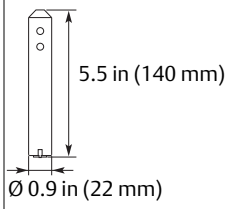
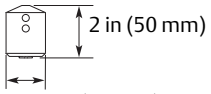
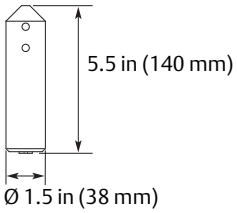
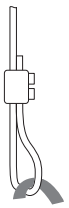
Performance Mode	Description
Normal (Long battery life)	Normal Performance Mode is suitable for most applications, and gives a long battery life.
High (Short battery life)	High Performance Mode gives better performance in difficult applications (foam, turbulent surface, low dielectric constant). Each update is based on an increased number of measurements (radar sweeps), which gives improved robustness and decreases the noise in the output value. However, High Performance Mode reduces battery life significantly (40-60%).

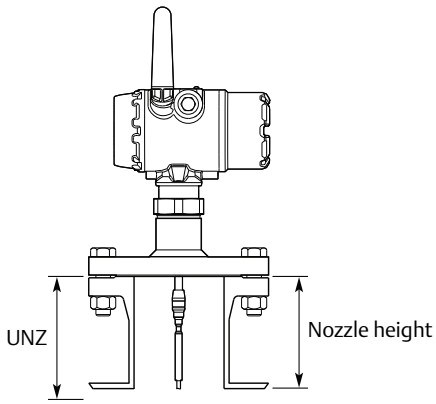
Power Mode	Configures the device to take periodic measurements to conserve battery life, or to take continuous measurements. **Note** Always On mode is only recommended for devices connected to line power.
Power Source	Optimizes the device to make use of the power source to which it is attached.

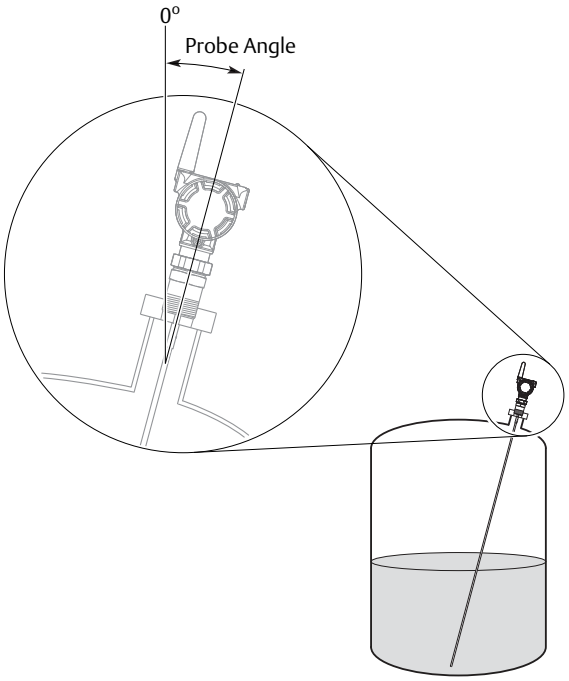
D.3.3 Manual Setup - Level

Probe

Weight Type	Type of weight at the end of the probe. Only applicable to the Flexible Single Lead probe type.

Weight Type	Option Code	Description
Unknown		Default
Small	W1	
Short	W2	
Heavy	W3	
Chuck (anchored)	W4	

Upper Null Zone	Defines how close to the device's Upper Reference Point a level value is accepted. You can extend Upper Null Zone to block out disturbing echoes close to the tank top. View the Echo Curve to find out if there are disturbing echoes close to the tank top. This parameter should only be changed if there are measurement problems in the upper part of the tank. Such problems may occur if there are disturbing objects close to the probe. By setting the Upper Null Zone, the measuring range is reduced. See "Changing the Upper Null Zone" on page 94 for further information. **Note** Measurements are not performed within the Upper Null Zone. and level alerts located in the Upper Null Zone will not be triggered. Always configure your level alerts below the Upper Null Zone. For narrow nozzles it may be necessary to increase the Upper Null Zone (UNZ) in order to reduce the measuring range in the upper part of the tank.  By setting the UNZ equal to the nozzle height, the impact on the measurement due to interfering echoes from the nozzle will be reduced. See also section "Handling disturbances at the top of the tank" on page 92. Amplitude Threshold adjustments may also be needed in this case.

Probe Angle **(Only applicable to rigid probes)**	Defines the angle compared to the plumb line at which the device with probe is mounted (0 means that probe is mounted vertically). Enter the angle between the probe and the vertical line. Do not change this value if the transmitter is mounted with the probe along the vertical line (which is normally the case). 
Remote Housing	If the transmitter head is mounted apart from the probe, the length of cable between probe and remote housing must be configured.
User Defined Probe Settings	Parameters for user defined probe. **Note** These settings should only be modified for customized probes. The settings are typically provided by factory.

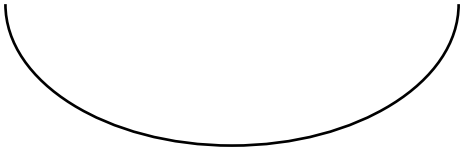
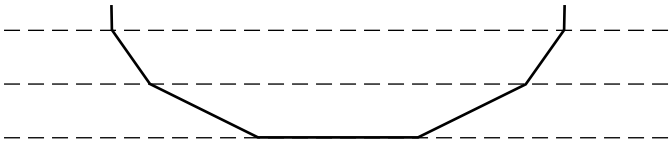
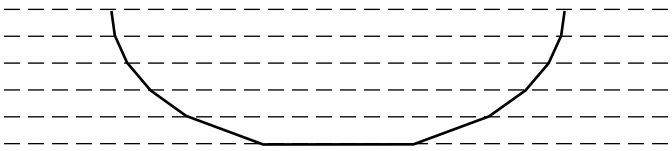
Geometry

Calibration Offset	Difference between surface distance measured by device and the same distance measured by e.g. handgauging with a measurement tape. A positive Calibration Offset value will increase the presented Level value.
Show Level Below Probe End as Zero	When this setting is selected and the product surface is at or below the probe end, the level measurement output will be zero. **Note** Only applicable for negative probe end peak.

Environment

Vapor Dielectric Constant	Enter the dielectric constant (DC) for the vapor gas in the tank. For normal air the vapor DC is close to 1. In some applications there is heavy vapor above the product surface having a significant influence on the level measurement. In such cases the vapor dielectric can be entered to compensate for this effect. The default value is equal to 1 which corresponds to the dielectric constant of air. Normally this value does not need to be changed since the effect on measurement performance is very small for most vapors.
Max Upper Product Thickness	Configure the maximum possible thickness for the upper product in this tank. This is the maximum thickness the device will expect for this tank.

Volume

Calculation Method	Select method for volume calculation based on tank shape or a strapping table. Strapping table requires entering level-volume pairs in a table.
Diameter (L1)	The diameter of the tank.
Length (L2)	The length (or height if the tank is shaped as a vertical cylinder) of the tank, measured between tank ends.
Strapping Table	Use a strapping table if a standard tank type does not provide sufficient accuracy. Use most of the strapping points in regions where the tank shape is non-linear. A maximum of 20 points can be added to the strapping table. If tank type Strapping Table was chosen, enter how many entries you will use and the actual level and volume points. The strapping points must be entered such that the first point corresponds to the lowest level, and the last point corresponds to the topmost level of the tank. **STRAPPING POINTS**  Actual tank bottom may look like this  Using only 3 strapping points results in a level-to-volume profile that is more angular than the actual shape  Using 6 of the points at the bottom of the tank yields a level-to-volume profile that is similar to the actual tank bottom

D.3.4 Alert Setup

Signal Quality Alert

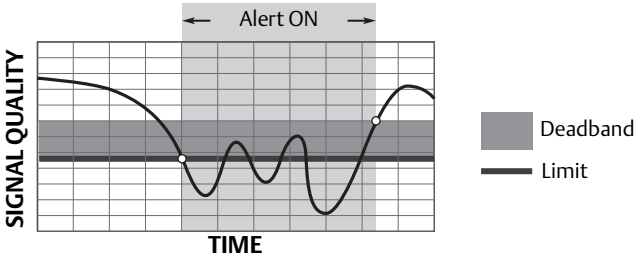
Signal Quality is the product surface echo amplitude compared to the surface threshold and noise. The Signal Quality spans from 0 to 10. A low value means that there is a risk for the noise peak to be mistaken for the product surface peak.

Build up on the probe and different surface conditions are factors that can result in a low Signal Quality value. By setting an alert, the Signal Quality value can be used to schedule maintenance to clean the probe.

Note
The Signal Quality depends on probe type and application conditions, as well as the condition of the probe. Even if the probe is clean, Signal Quality may not be a 10.

Suitable alert limits vary from application to application. Appropriate value can be determined by logging Signal Quality over time and viewing maximum/minimum values. The Signal Quality Alert limit should be at least 1, but a better guideline is 2-3.

Figure D-3. Signal Quality Alert



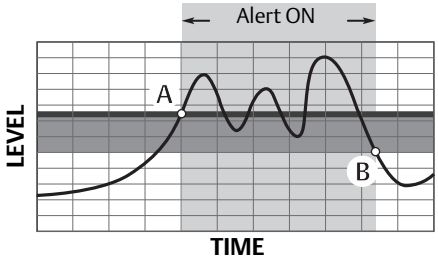
Enable Signal Quality Alert	If the Signal Quality Alert will be enabled or not.
Limit	When the Signal Quality value drops below the Limit, the alert is triggered.
Deadband	An area of the Signal Quality range where no action occurs to prevent alert from activating/deactivating too quickly.

High/Low Level Alerts

High/Low Level Alerts are triggered when the level goes outside the user defined Limits. There are 4 standard Level Alerts. Hi Level Alert and Hi-Hi Level Alert are used for rising levels, and Lo Level Alert and Lo-Lo Level Alert are used for falling levels. See Figure D-4 and Figure D-5 for more information.

Enable Level Alert	If the alert will be enabled or not.
Limit	The Level value that will trigger the alert. **Note** Alert Limit values must be outside the Upper Null Zone, the Blind zones, and areas close to the Blind Zones with reduced accuracy.
Deadband	An area of the Level range where no action occurs to prevent alert from activating/deactivating too quickly.

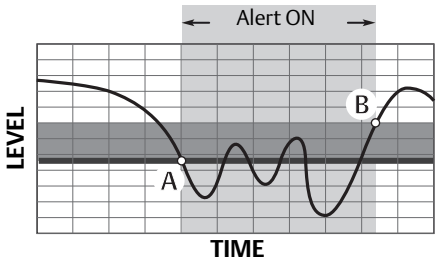
Figure D-4. High Level Alerts for Rising Levels



A The level is rising above user defined alert Limit. An alert message is displayed in AMS Wireless Configurator and on Field Communicator.

B The alert message is reset once the level value falls below the Deadband area.

Figure D-5. Low Level Alerts for Falling Levels



A The level is falling below user defined alert Limit. An alert message is displayed in AMS Wireless Configurator and on Field Communicator.

B The alert message is reset once the level value rises above the Deadband area.

User Defined Alert

Enable User Defined Alert	If the alert will be enabled or not.
Variable	The variable selected for the alert.
Alert Direction	Whether the alert will be triggered above or below the variable's value.
Limit	The variable value that will trigger the alert. **Note** Alert Limit values must be outside the Upper Null Zone, the Blind zones, and areas close to the Blind Zones with reduced accuracy.
Deadband	An area of a variable's range where no action occurs to prevent alert from activating/deactivating too quickly.

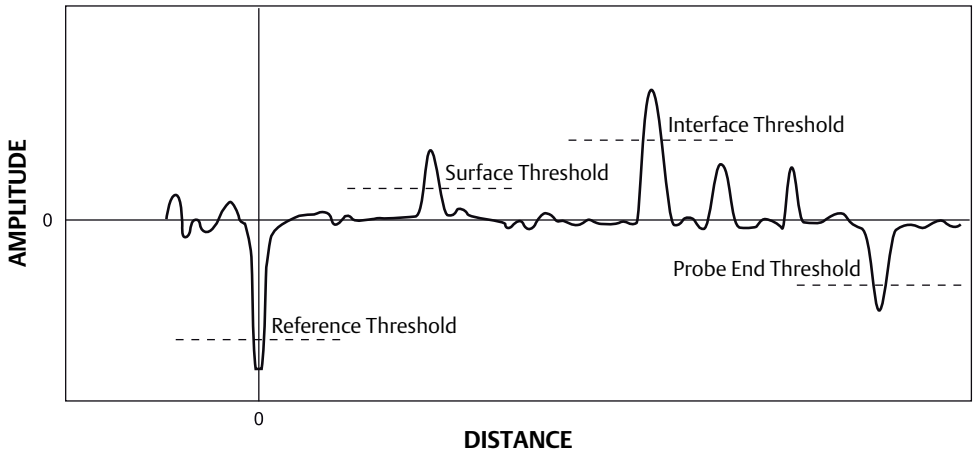
Lost Measurement

Lost Measurement Behavior	Configure level value to report if measurement is lost unexpectedly. Choose one of the following actions: **Lost Measurement Behavior** / **Description** Alarm (NaN Value/ Bad Status) — If the measurement is lost, the level value will report: "*Not a Number / Bad Status*". Output Full Tank — If the measurement is lost, the level value will correspond to full tank. Output Empty Tank — If the measurement is lost, the level value will correspond to empty tank.
Number of Measurements to Hold Level	The number of measurements the device will hold the current level if level measurement has been lost. Then it will output level according to Lost Measurement Behavior, if still lost. For an application where problems with lost measurement due to noise or weak surface echoes are experienced, this parameter value could typically be increased. The Hold Time value presents for how long the device will hold the current level. The time the current level will be held is calculated out of a combination of both Number of Measurements to Hold Level and the Update Rate. **Note** Make sure you have enough safety margin in your system to manage a delayed condition.

D.3.5 Echo Tuning

Thresholds

Figure D-6. Thresholds



Threshold Control	Thresholds can be automatically calculated by device or manually set by user. This setting is valid for all thresholds on the Thresholds tab (Surface, Interface Reference, and Probe End Thresholds).
Surface Threshold	Threshold to filter out noise in the echo curve for detection of the Surface. Noise below the threshold is suppressed. The first echo peak closest to the device that crosses and is above the Surface Threshold is the surface echo.
Interface Threshold	Threshold to filter out noise in the echo curve for detection of the Interface. The first echo peak after the surface echo that crosses and is above the Interface Threshold is the interface echo.
Reference Threshold	Threshold to filter out noise in the echo curve for detection of the Reference peak. The reference peak is a strong negative echo very close to the device.
Probe End Threshold	Threshold to filter out noise in the echo curve for detection of the Probe End peak. The probe end peak is a fairly strong positive or negative echo (depending on probe type) that is present at the probe end when tank is empty.

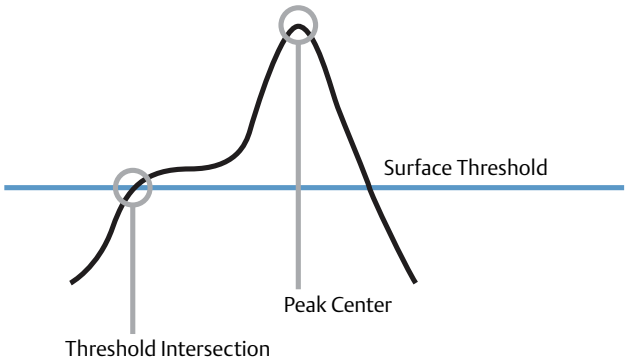
Near Zone Threshold

Threshold Control	The Near Zone Threshold can be automatically calculated by device or manually set by user.
Threshold	Threshold to filter out noise in a zone near the device. Noise below the threshold is suppressed. This threshold replaces the Surface threshold in the zone where it is applicable.
Distance	Distance from Upper Reference Point (normally the lower side of device flange) to point where the near zone threshold ends.

Near Zone Trimming

Trim Near Zone	Select to activate trimming. The Trim Near Zone method is used to fine tune performance in the area close to the tank top. This function is normally not used. Trim Near Zone is typically used if there are problems related to the nozzle. For more information see section "Using the Trim Near Zone function" on page 94.
Near Zone Has Been Trimmed	Indicates if the Trim Near Zone method has been used for this device.

Advanced

<table>
<tr><td>Peak Detection Method</td><td>Select which peak detection to use for level measurements. For furter information on when to use the peak detection method, see section “Resolving thin oil layers” on page 91.
<table>
<tr><th>Peak Detection Method</th><th>Description</th></tr>
<tr><td>Peak Center</td><td>Surface detected at the first amplitude peak closest to device detected above the Surface Threshold.</td></tr>
<tr><td>Threshold Intersection</td><td>Surface detected at first intersection with Surface Threshold.</td></tr>
</table>

</td></tr>
<tr><td>Near Zone Compensation</td><td>Improves measurement performance in the zone close to the device by compensating for probe dependent echo signature or recorded echo signature.

If Near Zone Compensation is disabled, neither the probe dependent compensation nor the compensation due to Trim Near Zone will be used by the device.</td></tr>
<tr><td>Echo Search Window</td><td>Select window mode to use for the echo tracking function. Value typically provided by manufacturer.</td></tr>
<tr><td>Window Size</td><td>Window size used by echo tracking function. Window Size can only be changed when the Eco Search Window mode is set to User Defined. Value typically provided by manufacturer.</td></tr>
<tr><td>Gain Factor Index</td><td>Controls the hardware amplification of the waveform. Value typically provided by manufacturer.</td></tr>
<tr><td>Calibration Scale Factor</td><td>Microwave propagation factor to use. Value typically provided by manufacturer.</td></tr>
</table>

Appendix E Mapping of Alert Messages in the HART command 48 Additional Status Field

E.1 Alert messages and descriptions

This appendix outlines the most important alerts in the HART® command 48 Additional Status Field for 3308 Series. The information in this section can to be used by DeltaV™ for alert monitoring, and in the Rosemount 1420 Smart Wireless Gateway for Additional Status mapping in Modbus®, OPC, etc.

A complete list of Additional Status bits is available in the Rosemount 1420 Smart Wireless Gateway.

Table E-1 to Table E-3 shows a list of the most important alert messages that may be displayed in the AMS® Wireless Configurator and Field Communicator together with the location of the Alert in the HART command 48 Additional Status field. For recommended actions refer to "Alert messages in AMS Wireless Configurator and Field Communicator" on page 74.

To view Active Alerts, do the following:

- From the *Home* Screen, go to **Service Tools > Active Alerts**.

Table E-1. Failure Alerts (F:)

Message	Additional status(1)	Description
Electronics Failure	Byte 8::Bit 6	An electronics error that could impact the device measurement reading has occurred.
Radio Failure	Byte 1::Bit 6	The wireless radio has detected a failure or stopped communicating.
Supply Voltage Failure	Byte 6::Bit 2	The supply voltage is too low and will affect device operation.
Probe Disconnected	Byte 4::Bit 6	The device cannot detect the probe.
Electronics Temperature Critical	Byte 1::Bit 3	The internal temperature of the device has reached critical levels and the integrity of the device electronics may be compromised. Environmental temperature should not exceed device specifications.
Configuration Error	Byte 2::Bit 6	The device has detected a configuration error. Reasons may be multiple. See Table 6-2 on page 75 for a list of detailed Configuration Errors that may be displayed.

(1) Location of the Alert in the HART command 48 Additional Status field.

Table E-2. Maintenance Alerts (M:)

Message	Additional Status(1)	Description
Supply Voltage Low	Byte 8::Bit 4	The supply voltage is low and may affect Device Operation.
Electronics Temperature Out of Limits	Byte 1::Bit 2	The temperature of the electronics board has exceeded the transmitter's operating range.
Level Measurement Lost	Byte 3::Bit 1	No valid Level reading. Reasons may be multiple: • No valid surface echo peak in the measuring range. • Incorrect transmitter configuration.
Simulation Active	Byte 8::Bit 0	The device is in simulation mode and is not reporting actual information.
Low Signal Quality	Byte 5::Bit 0	The Signal Quality is below the defined alert limit.
Interface Measurement Lost	Byte 3::Bit 0	No valid Interface reading. Reasons may be multiple: • No valid surface echo peak in the measuring range. • Incorrect transmitter configuration.
Capacity Denied	Byte 12::Bit 0	The device has failed to require all of the necessary wireless bandwidth to broadcast at the configured rate(s).

(1) Location of the Alert in the HART command 48 Additional Status field.

Table E-3. Advisory Alerts (A:)

Message	Additional Status(1)	Description
Database Memory Warning	Byte 0::Bit 2	The device has failed to write to the database memory at some time in the past. Any data written during this time may have been lost.
Non-Critical User Data Warning	Byte 2::Bit 1	A user written parameter does not match expected value.
Volume Range Warning	Byte 4::Bit 7	The level measurement is outside the configured volume range.
Button Stuck	Byte 1::Bit 5	The button on the Electronics Board is detected as stuck in the active position.
HiHi Level Alert	Byte 5::Bit 4	The level is above the defined limit.
Hi Level Alert	Byte 5::Bit 5	The level is above the defined limit.
Lo Level Alert	Byte 5::Bit 6	The level is below the defined limit.
LoLo Level Alert	Byte 5::Bit 7	The level is below the defined limit.
User Defined Alert	Byte 5::Bit 3	The variable has surpassed the user defined limit.

(1) Location of the Alert in the HART command 48 Additional Status field.

A

B

C

D

E

F

G

H

I

J

Index

T

U

V

W

Z

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